NATIONAL PETROLEUM NEWS

1938 New Car Lubrication Issue

Advertisers' Index on Page R-15 And Page 128

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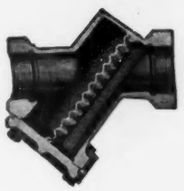
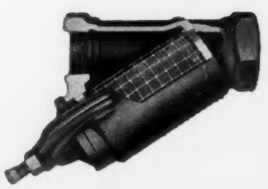
JANUARY 12, 1938

REFINING TECHNOLOGY EDITION

MORRISON
LINE STRAINERS





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LAST MINUTE
OIL NEWS SECTION

News By Teletype From 4 News Bureaus

National Petroleum News

News From Oil Industry Everywhere

VOLUME 30 WEDNESDAY, JANUARY 12, 1938 NUMBER 2

New German-Made Diesel Announced At S. A. E. Meet

By Telegraph

DETROIT, Jan. 11.—A concentration of committee meetings marked the opening of the annual meeting of the Society of Automotive Engineers here Monday. Committees whose decisions and deliberations direct the work of the co-operative groups of the society, principal organization of the automotive industry, began on Sunday and will continue through the week.

Important oil-automotive meetings, such as those of the crankcase oiliness committee, a group discussing oil change and the Co-operative Fuel Research group have already had long sessions in which data previously obtained by individual laboratories have been studied and correlated. Plans have been made for further prosecutions of these various problems, all of mutual interest to the oil and automotive industries. While no announcements have been made to the public, important steps have been taken, it is understood, which will affect the future manufacturing activities of both the oil and automotive industries.

On Jan. 13 and 14 a series of sessions will be held discussing anti-knock testing of fuels, the use of diesel engines for automotive and air-craft purposes, and the results of co-operative research on a number of problems.

New German Diesel

In one paper it will be announced that the Germans are now completing a diesel engine of 2000 horsepower which weighs less than one pound per horsepower. This engine is reported to be designed for air-craft use, and American manufacturers are accused of overlooking a bet by not designing a diesel for similar purposes in America.

An investigation of truck speeds and gradability, which it is hoped will aid in forming a basis for rational truck regulations has recently been undertaken by the U. S. Bureau of

(*Continued on page* 18)

OIL IN GEORGIA?

HOUSTON, Jan. 8.— Pan American Production Co. will start the first deep test ever to be drilled in Georgia early this year, it was announced this week. Exact location has not been decided, but it will be in the southeastern part of the state.

Preliminary geological work was started about two years ago but little attention was attracted because Georgia is never mentioned in discussions of probable oil territory. Surface mapping yielded little information as coastal Georgia is covered by a mantle of sand.

Initial magnetometer work was done by the Independent Prospecting Co. and this was followed by seismograph and core drill operations.

Five Counties

On the findings through these methods the companies sponsoring the work blocked a large area in Wayne, Appling, Pierce and Coffee counties. Pan American, Adams Oil & Gas Co. and others are interested in the partnership holdings with Pan American owning 50 per cent and operating control. The Pan American also has several thousand acres on its own account.

Deepest test in Georgia to date is that drilled in 1923 by Dixie Oil Co. east of McRae, Wheeler county, about five miles from the oil "spring" or seepage at Scotland, Telfair county. The Dixie well went to 3384 feet and was abandoned without result. The Pan American block is some distance south of this test.

Madison Trial Nears Close; Arnott Completes Testimony

By Teletype

By E. L. BARRINGER

N. P. N. News Bureau

MADISON, Jan. 11. — Independent Mid-Continent refiners, named in the indictment as curtailing gasoline production, actually increased their output substantially in 1935-36, so the defense chief accountant testified late today as the conspiracy trial in Federal Court here drew rapidly to a close.

The famed July 20, 1934 letter from Secretary Ickes authorizing stabilization work by C. E. Arnott, of Socony-Vacuum Oil Co., the chairman of the marketing committee of the Planning and Co-ordination committee was finally admitted in evidence when offered by government counsel.

To offset government counsel's attempts to disparage Dr. John W. Frey's status in the Petroleum Administrative Board during code days, defense counsel had brought to Madison by airplane a certified copy of Frey's PAB assignment, signed the day previous by Secretary Ickes in Washington.

Government counsel brought out on cross-examination names of defendants with whom Arnott said he had talked about buying activities.

The trial, now in its fourth month, is nearing completion. James D. Miller, defense chief accountant, recalled to the stand today may be the final defense witness. Then comes rebuttal testimony for the government, the motions, summation, and then the case, that started Oct. 4, goes to the jury.

Arnott, a defendant, who began testifying Jan. 4, remained on the stand until mid-morning Jan. 10, testifying about history of the Mid-Continent, East Texas and Gulf buying activities, and to contacts with PAB members to show the oil administration had knowledge of tank car market stabilization.

Other defense witnesses during the week were J. D. Collett, chairman of the former P and C Committee, David G. Gray manager of the Waggoner Refining Co., in 1935, and Miller.

At the first night session of the trial, Jan. 10, the court heard offers of proof from Chief Defense Counsel Donovan.

Proof of Secretary Ickes' "knowledge" of stabilization aiding tank car prices was re-

(*Continued on page* 19)

Station Operator Is Granted $7500 Of Lindbergh Reward Money

NEW YORK, Jan. 11. — The alertness of a service station operator in noting suspicious circumstances in his contacts with the public brought Walter Lyle, operating a station of the Warner Quinlan Co. in New York, the largest individual share in the $25,000 reward posted by the state of New Jersey in the Lindbergh kidnapping case.

On Jan. 10, at Trenton, Governor Hoffman of New Jersey awarded $7500 to Lyle, who provided the clue that led to the arrest of Bruno Hauptmann in the latter part of September, 1934, for the kidnapping. On Sept. 14 Lyle had received a $10 gold certificate from a customer. Suspicious that anyone should attempt to pass a gold note after the federal government had called them in, Lyle jotted down the license number of the automobile on the margin of the bill.

John J. Lyons, a helper at Lyle's station, received the bill in his pay envelope and changed it for other currency at a branch Corn Exchange bank, first calling the teller's attention to the fact that it was a gold certificate and bore the notation of a license number, which proved to be that of the automobile driven by Hauptmann.

Lyons received $1000 of the reward money and the teller who detected and identified the bill as part of the ransom money received $2000. Ten individuals received $22,000 of the reward money, in amounts varying from the $7500 given Lyle down to $500. The other $3000 reward money will go to some 100 persons, mostly bank clerks, who were instrumental in identifying ransom bills.

'Mixed Carload' Rail Rates Draw Complaint of Jobbers

N. P. N. News Bureau

WASHINGTON, Jan. 10.—A general investigation into rail freight rates on petroleum products appears more likely than ever now, with the filing of a complaint at the Interstate Commerce Commission by a group of about 30 oil jobbers in Midwestern states attacking the "mixed carload" charges of railroads.

The new complaint broadens the issues at point in the several cases already on file with ICC attacking the estimated weight of 6.6 pounds per gallon used by the railroads in assessing freight charges on petroleum products. It has been thought for some time that these cases alone might precipitate a general investigation of the petroleum rate structure. (NPN, Sept. 22, p. 9).

Complainants in the latest case to be filed attack the tariff rules of the railroads which permit the freight charge for shipment of a mixed carload of petroleum products (in a compartment tank car) to be assessed at the highest carload rates applicable on any of the articles loaded in the car, and based on the highest minimum estimated weight for any article in the car.

For instance, a compartment car containing, among other products, gas oil and gasoline, would be charged on a weight basis for gas oil (which moves at an estimated weight of 7.4 pounds per gallon), but the rate assessed would be the gasoline rate.

Thus, the "estimated weight" of the total contents, including gasoline, is made greater by application of the 7.4 pounds per gallon figure to the entire contents, and then the "cents per pound" rate for gasoline is applied to this total weight. Gasoline moves at charges based on an estimated weight of 6.6 pounds per gallon, when in a tank car by itself, and this is being attacked as too high by the complaints of hundreds of shippers in the "6.6 cases."

Standard Intervenor

Oil companies in the Dakotas, Colorado, Kansas, Minnesota and Nebraska filed the "mixed carloads" complaint, and it has already been intervened in by Standard Oil Co. (Indiana), which asserts that if the commission finds the rates, weights and charges unlawful as charged, and grants reparation to the complainants, then it, too, seeks reparations. Besides reparations, the complainants ask that ICC fix charges based on a different method.

They charge that the rates based on the present "mixed carload" basis are excessive, unreasonable, and unjustly discriminatory in favor of shippers who get petroleum products in straight carloads in tank cars, or in packages, in box cars, or cars of other types.

Under rail tariff regulations, "refined oils," including gasoline, move at an estimated weight of 6.6 pounds per gallon, and other heavier oils, including gas oil, fuel oil, and crude, at 7.4 pounds.

Diesel Announced At S. A. E. Meet

(*Continued from page* 17)

Public Roads, in co-operation with other agencies and a truck sub-committee of the Automobile Manufacturers Assn.

This scientific approach to highway regulation was outlined here today by Prof. J. T. Thompson, highway research specialist for the Bureau of Public Roads and professor of civil engineering at Johns Hopkins University, in an address before the S. A. E.

Outlines Details

Prof. Thompson outlined the mechanical details of the preliminary investigation and pointed out that the job "thus far has been one of development and of laying plans for the future." Emphasizing the highway problem which results when slow moving vehicles impede the proper tempo of traffic, he outlined four possible solutions.

Four Solutions

"We may reduce gradients, we may separate fast and slow traffic either by multi lane construction or by building two separate and distinct routes, we may hold power plants at their present level and reduce legal loads or we may retain present load restrictions and increase engine power," he said.

He pointed out that none of these solutions would be adopted to the exclusion of the others but that various combinations of these possibilities would influence the final results in actual practice.

The first efforts of the road bureaus' co-operative investigation have been directed toward the development of apparatus and procedure for studying truck hill climbing practice. A uniform six per cent grade was selected on U. S. Route 40, near Baltimore, for this study. Its length of 2000 feet was sufficient to decelerate practically all trucks to a constant climbing or crawl speed, Prof. Thompson said.

Future plans for the investigation call for obtaining additional hill climbing data from state highway planning surveys and from the army equipment dynamometer laboratory at Camp Holabird in Baltimore. Also a study is being made of the availability or development of devices for use in enforcing performance regulations when they are finally introduced.

In discussing Thompson's paper, Merrill Horine Mack, truck sales production manager, pointed out that the truck operator and industry had little to fear from future highway regulation so long as it is being approached from as scientific a manner as Prof. Thompson outlined.

Fusion-Welded Cars

WASHINGTON — Interstate Commerce Commission has granted Union Tank Car Co. permission to build a number of tank cars by the fusion-welding process, including 100 for experimental use in transportation of petroleum products.

Supreme Court To Rule On Truck-Weight Law

By Teletype
N. P. N. News Bureau

WASHINGTON, Jan. 11.—Decision by the U. S. Supreme Court is expected within the next few weeks on validity of the South Carolina maximum truck weight law, held unconstitutional last January by a statutory, three-judge federal court and appealed to the high court by South Carolina officials.

The case was argued before the Supreme Court last week, with S. King Funkhouser and Frank Coleman appearing for shippers and motor carriers, Steve C. Griffith for the state of South Carolina, and Thomas W. Davis for intervening railroad defendants.

Arkansas Pipeline Case

N. P. N. News Bureau

WASHINGTON, Jan. 11.—The U. S. Supreme court has agreed to review a decision of the Arkansas Supreme Court which held that Arkansas Louisiana Gas Co., Shreveport, must file schedules and rates for natural gas sold and delivered to its pipeline customers in Arkansas.

Oil Employment At 1929 Level, Teagle Advises

N. P. N. News Bureau

WASHINGTON, Jan. 10. — Responding to a letter sent out by the Senate committee studying causes and cures of unemployment, Walter C. Teagle, president of Standard Oil Co. (New Jersey), wrote the committee that the petroleum industry is employing as many workers today as in the previous peak of 1929.

The unemployment committee, headed by Sen. Byrnes, S. C., is seeking to find among other things, how much the use of labor-saving machinery has contributed to unemployment, and Teagle's comment on this phase of the investigation, as applied to the oil industry, was:

"Attention should be called to the fact that the labor factor in the production, transportation and refining branches of the petroleum industry is not the major item of cost, as is the case in many mass-production industries. Consequently, the primary emphasis on cost reduction is not upon the introduction of labor saving devices.

"The direct labor cost in refining is between 30 and 35 per cent of the total processing cost, including depreciation and overhead, whereas the cost for fuel alone is from 20 to 25 per cent of the total. Technological efforts have therefore been directed primarily towards mechanical improvements, fuel economies and increased yields of the more valuable products from the crude run.

"It is the opinion of our operating people that our company has today as many workers, either directly or indirectly, as were employed in the previous peak in 1929, and in discussing this phase of the situation with the president of the American Petroleum Institute, he is of the opinion that this is the experience of the industry as a whole."

Teagle's letter was one of several response letters released by the committee. The letters requesting opinions were sent out to industrial and business leaders, labor men, mayors, governors, and others in an effort to get a cross section of opinion as to causes and cures of the unemployment problem.

Buckley 'Discouraged', Says Arnott

(*Continued from page* 17)
ceived in evidence on defense counsel's offer of a letter from Ickes to a Kansas City firm in March, 1935.

Arnott Meets Buckley

Arnott continued on direct examination Jan. 5, after giving details of the Mid-Continent tank car stabilization committee on Jan. 4.

His first meeting with Neil Buckley, representing East Texas Refiners Marketing Assn., Arnott testified, was on Feb. 9 or 10, 1935, while he was in Pinehurst, N. C. Dr. E. R. Lederer, East Texas refinery allocator, telephoned to introduce Buckley and say that Buckley "had something very important and very interesting" to lay before Arnott.

Buckley came to Pinehurst Feb. 11, Arnott added, stating that "he had been talking with East Texas refiners who had recently formed the East Texas Refiners Assn.; that he was rather discouraged in his accomplishment up to that time, and that he found that members of the industry he had contacted had very little confidence in the sincerity of those refiners, and it was a question in his mind whether he was going to have very much success in his efforts."

Buckley also told him, Arnott continued, that "he had looked into the situation; he had deliberately analyzed it with as much care as he could, and he really felt that these refiners were sincere. That they had everything to gain by being cooperative with the industry and with the PAB in bringing themselves into good practices, allocations, and all of those things that they had been so free and disregardful of."

'Most Demoralizing'

Arnott said he had not heard of the association before, and told Buckley he was interested in the statement and that "the industry had found the East Texas refiners one of the most demoralizing and the greatest disturbance that we had to contend with."

Buckley said East Texas refiners wanted him, through the new association, "to find ways of contacting the large buyers so that they would find a market for their distress gasoline," the witness testified.

Arnott said he told Buckley that doubts as to whether East Texas refiners would really come under the code authority, submit to allocations and run only legal crude would have to be overcome.

"I told him that I was stabilizer for the industry, and I assumed that my responsibility was to deal with every phase of the industry, even including East Texas," Arnott continued.

Next, Buckley was at a meeting, for stabilization of marketing in Texas, held at Chicago Feb. 25, Arnott testified, and invited into the meeting. Buckley related the story told Arnott in Pinehurst.

"There was almost unanimity in the expressions that they had no confidence in the East Texas refiners," Arnott testified about the discussion after Buckley addressed the meeting.

'Very Discouraging'

Buckley felt his Chicago contact had been "very discouraging," Arnott added.

The next contact with Buckley, Arnott said, was at a meeting in New York on March 6, 1935, of representatives of eastern major companies.

"The normal market for East Texas gasoline is Texas and the eastern seaboard," Arnott said in explanation of why only eastern companies were at the meeting.

O. D. Robinson, Republic Oil Co., came to see Arnott in early January in behalf of himself and independent Gulf refiners, it was testified.

Robinson's story was one of deep distress on account of price wars and selling of gasoline below cost, Arnott testified. Robinson came in the hope "that I could give him some advice, and with the further hope that I might be willing to offer some suggestions and some help," the witness added.

Gulf independent refiners had not been overly cooperative in code observation and had little regard for the manner of dumping gasoline, Arnott said he told Robinson.

After Buckley and Robinson told their stories at the March 6 meeting, Arnott said, "opinions ran from the complete negative to that of those who felt that it ought to be dealt with constructively."

A committee was formed to accompany Arnott to the allocators' meeting at Washington on March 13, he added.

Minutes Read to Jury

Minutes of this allocators' meeting were then read to the jury, overlapping into the afternoon session of Jan. 5.

Arnott's telegram calling the March 15 meeting at New York was received in evidence and Arnott was asked to explain the words "the question of surplus gasoline . . . must be finalized tomorrow."

He explained that "surplus gasoline" referred to the material mentioned by Robinson and Buckley. By "finalizing tomorrow", Arnott said he meant his feeling that "we had reached the time that something ought to be said to them as to whether anybody was interested in what they said."

Referring to the March 15 meeting, Arnott said: "Some one—I don't remember—roughly put down some figures as to data that had come out of the allocators' meeting."

It was merely to see, Arnott added, whether if all buyers of gasoline were to consider this surplus gasoline, "what it would look like."

"Nobody at that meeting made any reference to being individually interested in buying this gasoline," Arnott declared.

Meeting Buckley at a general stabilization meeting in Washington on March 20, 1935, Arnott said he mentioned Sinclair was a large buyer of gasoline, that Gulf was a substantial buyer of East Texas gasoline, and that he had heard that Cities Service was about to put in some orders.

Arnott's next contact with Buckley, according to the testimony, was at Excelsior Springs, Mo., at the Western Petroleum Refiners Assn. meeting in April, 1935, where Buckley said he would have to give up the association work to devote more time to his job with Cities Service Export Oil Co.

Arnott said he felt it important that Buckley remain with the East Texas work, as Buckley "demonstrated himself as a very serious-minded and very sincere and conscientious gentleman."

An Ex-Stabilizer

Buckley was also at a meeting in New York on May 29, 1935, right after the supreme court killed the NIRA, it was testified.

Asked about someone remarking at this meeting that he was "an ex-stabilizer", Arnott said his reply was:

"As far as I was concerned, I felt that I was going on; and I was going to observe the good practices, and all those things that the code had brought to us; and whether we had a code or whether we had stabilization, as far as I was concerned, my viewpoint and my activities were going to be more stabilized than ever."

Buckley met Arnott at the American Petroleum Institute meeting in Los Angeles in No-

(*Continued on page* 21)

Biggest Customer's Future Needs

(In the Jan. 19th N. P. N.)

● Oil's biggest customer, in Detroit, this week, is making up his mind what kind of fuels and lubricants he will be buying in the future.

Not next week, nor next month, nor the next several months, but, nevertheless, almost as definitely as if they were specifications on signed purchase orders, the automotive industry's future needs for fuels and lubricants are established as an outgrowth of discussions, committee reports and so on at the sessions of the Society of Automotive Engineers, the most important organization in that industry.

Far ahead of any public announcement by any car manufacturer, or diesel or aviation company on a new engine, the chemists, physicists and engineers have decided what types are practical to build and have learned from the oil industry's technical men that the suitable fuels and lubricants will be commercially available at the needed time.

This week, at the annual S.A.E. meeting in Detroit, these points are being worked out for some future time. Far seeing men in the refining and marketing industries can get their first key to the products they will be called on to make and sell tomorrow, from the reports from this S.A.E. meeting in the Jan. 19th issue of NATIONAL PETROLEUM NEWS.

Two N.P.N. Editorial men—Arch L. Foster, technical editor, and John W. Thompson, writer on automotive subjects—are in Detroit hearing and studying the vast amount of technical material presented at this meeting, digesting it and analyzing it from the oil men's viewpoint, to tell N.P.N. readers first what their customers will really be asking for—some time in the future—when they say, "Fill 'er up with gas and look at the oil."

What Would *YOU* Advise?

Jobber Of Major Company Product Debates Turning To Private Brand

How would you, Mr. Reader, advise this oil jobber?

Should he sell under his own private brand alone, or under his private brand tied up in a group operating under a master trade mark (like Dixie, Sovereign Service, Hello Neighbor, etc.) or under the brand of a large integrated company?

The following letter came from a small but well established oil jobber in a prosperous state west of the Mississippi river. He wants the editor to tell him what he should do. The editor says there are many points on all sides of the question, too many for a letter.

So, we ask the oil men generally to advise him, if they will, and his inquiry will also be the means then of arousing a discussion on the status of the independent jobber which should enlighten every one.

More knowledge of the jobber, what he contributes to the oil industry both under his own brand and under a major company brand, and more study of his status in the oil industry, are direly needed today.

This western jobber—we have never seen his station—seems to raise the question of the competition between a new, modernized, fine looking station and an older type of station.

Progress in all things is not only highly desirable but necessary for the country's development but at times such development handicaps some one.

How about the man with an old style station who today has to compete with a brand new station?

What is he going to do?

Can he make his excellent personally conducted service offset the better appearance of the competing station?

Or does a new and modern type station cost so much as he thinks and may there not be some way in which to finance it on a partial payment basis?

A full discussion of these and other points raised in the letter should be valuable to all. We invite every reader to participate, whether he is big company or small, refiner or jobber, owner, salesman or truck driver. If you do not wish your name and identity to be used in your answer then please so state and we will keep it confidential. However, as a matter of good faith, please let us know who you are when you write.

Just address The Editor, NATIONAL PETROLEUM NEWS, Cleveland, Ohio.

* * *

Dear Editor:

"We would like to have your opinion on the situation which is confronting us. We have been subscribers to NATIONAL PETROLEUM NEWS for several years and I believe you can give us the outside view of what is best for us.

"We are jobbers and have handled a major company's products for several years but we can't seem to make much progress. It seems that the other majors are spending a large amount in rebuilding which we cannot afford. We own our bulk station and a super service station along with a very good country business and haul to two outside dealers.

"We have been thinking of going entirely independent and buy from independent refineries. What do you think of the idea, and how would you suggest operating if we make the change, or should we stay with the majors? Would it be advisable to put in a better gasoline at the third grade price to offset the beautiful stations being built by the major companies?

"Your information comes from over the whole United States therefore I believe you can give me some good ideas on how I should operate here."

Iowa Jobbers Plan Live Meeting In March

MANCHESTER, Ia., Jan. 8.—The annual convention and trade exhibit of the Iowa Independent Oil Jobbers Assn. will be held March 2, 3 and 4 at Fort Des Moines Hotel, Des Moines, Ia., according to A. C. Gienapp, secretary.

A live program is being planned, Mr. Gienapp says, with "dynamic speakers, full of pep, educational, inspiring and entertaining". A number of booths already have been leased for exhibits and hotel reservations have been made, he said.

Missouri Jobbers Plan Meeting

JEFFERSON CITY, Mo., Jan. 10.—A convention which will endeavor to bring the Independent oil jobbers of Missouri together in closer relationship, is being planned for the Missouri Independent Oil Jobbers Assn. for Feb. 9 and 10, at Hotel Baltimore, Kansas City.

Speakers capable of presenting their particular subjects well, are being lined up for the program, according to the association bulletin. A banquet the evening of Feb. 9 will be followed by entertainment by WHB radio station artists' bureau.

Kansas Jobbers Plan 24th Program

WICHITA, Kan., Jan. 10. — Three speakers, to be announced, will appear on the program of the Kansas Oil Men's Assn. when it meets for its 24th annual convention Feb. 14 and 15 at Hotel Broadview, Wichita.

Because of trials and tribulations confronting jobbers, C. E. Holmes, secretary, said he believes that there should be good attendance and that jobbers should bring their problems along and discuss them.

Exhibitors of last year are said to be taking space this year. There will be a dance and floor show Feb. 14 and on the evening of Feb. 15 a regular American league hockey game between the Wichita Skyhawks and Tulsa Oilers.

Detroit Dealers' Premium-Giving Case Is Advanced

DETROIT, Jan. 10.—Michigan's fair trade practice law, after riding the bumps in Wayne County circuit court here these past few weeks, finally found a soft spot Jan. 7, when county circuit judge Henry Nicols denied a motion to dismiss a bill of complaint against Victor Miller, Detroit service station operator.

The complaint was filed several weeks ago by the Retail Gasoline Dealers Assn. of Michigan, charging Miller with giving premiums with purchases of petroleum products.

Denial of this dismissal, and subsequent denial of an appeal for a new hearing, means that the case will come to trial within two or three weeks, according to Rankin P. Peck, association secretary.

Although the premium section of the state law was declared invalid in local circuit court recently in a case of the Michigan Gas Dealers Union No. 1 against Liberty Service Stores, this case against Victor Miller will be the association's first real case to test the law's strength, it was said. Whatever the outcome, it is expected that the losing side will appeal to the state supreme court.

Wayne county prosecutor Duncan C. McCrea, acting under the authority given him by the fair trade law, has been making investigations of certain retail trade practices in the oil industry. Some of his findings are reflected in a resolution adopted by the dealers' association Jan. 3, in which Governor Frank Murphy was asked to bring to the attention of either state or federal officials that an "unjust and unlawful" practice exists in the trade.

The association charges that certain tire manufacturers have been granting special discounts paid in one of a number of forms to gasoline dealers handling their products, which enable these dealers to sell gasoline at less than the market price.

The resolution was approved by approximately 400 dealers attending the meeting and was sent to Governor Murphy Jan. 3, according to Peck.

Arnott Says PAB Informed of Buying

(*Continued from page* 19)

vember, 1935, and said that several East Texas refiners were "in a desperate plight for need of orders," it was testified. Arnott said he communicated with several large buyers but that he did not know if the companies bought.

Next, Buckley telephoned Arnott at New Orleans in January, 1936 about East Texas refiners needing orders, according to the testimony, while Arnott was there on the proposed oil code. Arnott said he telegraphed Harry Fruehauff, of Cities Service, soliciting a 50-car order, but didn't know whether the company bought.

Judge Stone ruled out a question about the Blazer committee report, Donovan remarked that the report might have a "great bearing" on the case.

Argue Over Fahy Letter

At opening of court Jan. 6 Donovan and government counsel argued over Arnott testifying to his state of mind when writing a letter to Fahy on Feb. 20, 1935.

The letter referred to "some very important developments in connection with marketing, and also in connection with East Texas refiners."

Donovan argued that "he is entitled to show here on the trial as a matter of fairness what was in his mind when he wrote that letter."

The court had said, "Mr. Arnott could have expressed more clearly if he desired, what his state of mind was when he wrote that letter, if he wanted to convey ———"

"When he wrote that letter he never expected he was going to be brought to trial here," Donovan argued.

Arnott's answer to the question was: "I wrote that letter because I wanted the PAB to know what I was doing in connection with this matter of distress gasoline that was such an important factor in the restoration of markets which had been a matter of conversation between us and was the objective we were working for."

Seeing Dr. Frey at the Feb. 25 stabilization in Chicago, Arnott told him that the meeting was airing some difficulties between operators in and outside of Texas, according to the testimony.

Arnott said he asked Frey if he thought it wise to come into the meeting and that the PAB member thought it was not. Arnott told Frey about Buckley's efforts and gave him some particulars about Mid-Continent developments, it was testified.

At a conference with the PAB in Washington on March 12, Arnott said Fahy mentioned that Frey had related his conversation with Arnott at the Chicago meeting.

Anti-Trust Laws

Asked by Fahy at the time if "there was anything in this that was not in line with the letter of July 20 concerning the anti-trust laws," Arnott said he replied by giving the PAB chairman "the full picture of the Mid-Continent development, the report of the McDowell committee."

Fahy expressed himself, according to Arnott, "as being very interested and said he would be glad to know how things came along."

"Did you ask for formal approval of the secretary?" Donovan asked.

"It did not occur to me to ask for any approval," Arnott testified. "What I told Fahy was, I thought, entirely in regard to an informal co-operative plan, and I say apparently Fahy thought so, too. He did not say anything about the subject. It was entirely informal, and it would seem to me if he had anything to say he would have said it, but he did not say anything about it."

When Donovan asked Arnott as to his state of mind when he left the meeting an argument resulted but government counsel withdrew the objection.

"My state of mind, your honor, was when I left that meeting, that I had fully told those gentlemen of the plan, and that both Mr. Fahy and Dr. Frey thought it was a good one and hoped that it would work," Arnott testified.

"Did you ever tell the PAB, or any member, that you did not want their approval?" Donovan asked.

"Certainly not," replied Arnott. "I did not. In fact, I wanted them to know what I was doing, and to have anything they had to say to me, if they had it to say."

At the March 12 meeting Arnott testified he did not say anything about the buying activities being carried on on his own responsibility.

Says Frey Confused

Arnott testified that, in his judgment, Frey was confused in testifying that Arnott said buying activities were being carried on on Arnott's own responsibility.

The statement about "own responsibility" Arnott continued was on a different matter at the May 8 meeting of the PAB.

"My interpretation of that letter," Arnott testified in reply to a question by the court about Ickes' July 20 letter, "was that I had been asked to do a job; and it was my purpose and my effort to seek, according to that letter, to bring about, through co-operative measures the stabilization or the restoration of price levels, which had been caused by price wars; and in doing this, to bring about a relief in the economic and physical waste which was referred to in that letter as a cause of price wars."

"I did not consider the letter of July 20 as giving me authority to violate the law," Arnott replied to Donovan's question.

Arnott denied making a statement to Fahy, Frey or any PAB member that buying activity was not the board's concern and was a matter he would proceed on whether the PAB "thought it was a good thing or not."

Discontinuance of the tank car stabilization committee or its activities was not directed by Fahy or any other member of the PAB, Arnott declared. He said the "buying program" was not discussed with the PAB at the meeting of May 8, 1935.

'How Is The Buying?'

"After the meeting," Arnott continued, Fahy asked " 'How is the buying coming along?' And my reply was, 'All right so far as I know.' "

The statement about accepting

(*Continued on page* 24)

Fifty Oil Executives Summoned In Pennsylvania Investigation

PITTSBURGH, Pa., Jan. 11.—Fifty executives of all the refineries and pipeline companies operating in Pennsylvania had been subpoenaed today to appear at the Bellevue-Stratford Hotel in Philadelphia Feb. 1 to testify before the Pennsylvania Oil Industry Investigation Commission.

"So far as we know, no pipeline company or refinery was omitted, the highest official of each company who is resident within the state being subpoenaed in each case," Dr. Samuel B. Ross, research director of the commission, said.

The subpoenas were issued under power of Resolution 1659 of the House of the last state legislature, Dr. Ross said.

The subpoenas require the company officials to bring filled-out questionnaires submitted by the commission and all "books, records, papers and documents" supporting answers to the questions and to testify all they know concerning the oil industry in the state of Pennsylvania and on any other matters within the scope of the investigating commission.

111 Pages of Questions

Questionnaires distributed by the commission to date, accompanied by notice of the commission's power of subpoena, are as follows:

Form 37A was sent to producers, refiners and pipelines and is 15 pages long. No one company answers all pages, however. Individual enterprises are asked one page of questions. Partnerships are asked two, and corporations, three. Form 37A was sent to 5100 companies or individuals.

Form 37B for crude producers, totals 16 pages, some for small, the others for large producers. Sent to 5000.

Forms 37D and 37E totaling 66 pages, for refiners. To 50 companies.

Form 37C, a 12-page questionnaire to 20 pipeline companies.

A two-page questionnaire was previously sent to 28,500 service station operators—independent dealers and lessees and companies operating company-owned stations—in the state.

The questionnaires ask for minute details of company operation, both buying and selling, costs, profits and volume, and of the company structure.

Dr. Ross said the subpoenas for the Feb. 1 hearing were designed to get all questionnaires of the larger companies filled in and returned by that date. A number of oil companies today, however, had asked for delay and sought legal aid.

Letters accompanying the subpoenas informed each company that every care would be taken to prevent information from reaching competitors, but the commission was by no means pledged to secrecy and would be free to make public any information, if such was deemed in the public interest.

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Beware Tax Exemptions—

The Gun Still Points to You

By WARREN C. PLATT, Editor

There is much talk at Washington about amending the undistributed profits tax so as to "protect" the small business enterprise. But, in all the proposed amendments, the administration would keep the tax in principle and apply it to a great many thousands of businesses that may not be "large", as the Standard of New Jersey is large, but at the same time are not as small as a two-gasoline pump, roadside service station.

The principle of taxing the savings of a business remains. After management has decided how much money it is justified in paying out for dividends then government steps in and says that the business cannot pay some of its debts out of the remaining year's profits nor put up a new building, nor buy a new pump or truck, nor put by some liquid capital to expand to a nearby town, nor stow away a little hard cash in a safe bank or in government bonds against the always-to-be expected "rainy day", without paying tribute up to 27% for that privilege.

The administration says that you should hold all your profits AS CASH so that at the end of the year you can give them ALL to your stockholders so that they can spend them and thus keep your business from growing. If, by chance, the stockholders want to return some of that money for improvement, expansion etc., then you can sell them the plan and receive the cash from them in exchange for stock or notes. The idea of the administration is just that you pay out all your profits.

What business can stand that? What business can stand still forever? How many businesses are there where the management can, with any regularity, succeed in talking the stockholders out of the dividends they have just received?

Oil jobber associations and other oil associations have done an excellent job in sizing up this piece of shennanigan un-American legislation and soundly condemning it. They should not now permit themselves to be misled by proposals to exempt some of them from such a tax. As long as the principle of taxing savings and improvements of a business is on the statute book, no matter who it is aimed at, the principle can and will be steadily directed to the "small" business man on the plea of government needing the dollars and also that the "small" business man is not so "small" after all, that he is not yet "ill-housed, ill-clothed and ill-fed." History shows that once any new idea of taxation is placed on the statute books that idea is expanded and its application enlarged, but never decreased or finally killed.

Independent jobbers associations and their officers, for instance Former President Whiting of the National Oil Marketers Association, have publicly charged repeatedly that the tax on undistributed profits could only be aimed at the small business man for the purpose of eliminating him and thus leaving the large companies which government then could relatively easily take over and operate under a government supervision that would end free business in this country.

Supporting that alleged aim of this national administration is Commentator Walter Lippman who, some days ago, said of President Roosevelt's suggestion that he wanted to arrange for government and business to sit around the table and plan the course of business:

"Round table planning would foster, stabilize and institutionalize that very concentration of corporate power about which Messrs. Jackson and Ickes have been so disturbed. Who would sit in these round tables and dominate the discussion? Who but the corporate earls? Is there any place in these round tables for the thousands of small manufacturers and small business men?

"The president's interview reveals the fact, long since obvious to all the discerning observers of the New Deal, that Mr. Roosevelt's real desire is not to break up private concentration of economic power but to promote it and then to direct this private monopoly by the power of a centralized government.

"Mr. Roosevelt is an exponent of an economic system controlled by the decisions of its corporate earls and its political bureaucrats. The usual name for this is state capitalism, and it was state capitalism that the president advocated."

The absolutely certain effect of taxing undistributed profits is to prevent growth of both large and small companies, and to preserve the large companies which then could the more easily be regulated by government because the small business men would not be around to protest against the regulation also affecting them.

Oil, particularly, is an industry that has built itself out of its profits. Most of the companies, big and little, have grown by keeping their profits rather than by selling stock and most of those that sold stock would be better off today had they built more slowly out of their own profits and stayed away from the money gentry and the evils that too much capital brought.

But the vast majority of competitors in the oil industry have built themselves out of their own profits. They had no money to start with, maybe a few hundred or thousands of dollars, they interested friends who had small savings, they lived on the skimpiest of salaries while they were building. The wife often kept the books while the owner of the business even rustled the barrels in the dinky warehouse. Most of them had to make and plow back more than the proposed minimum exemption from the tax of $25,000 or they never would have gotten anywhere.

And above all the reason that they all worked so hard and deprived themselves was because they saw others in the industry who had built nice sizable businesses—not "large" businesses as President Roosevelt seems to be talking about but at the same time not the "small business" he also seems to have in mind.

Now Roosevelt's administration comes and says; "No, you can only grow to a certain small size, unless you happen to be a darn good stock salesman and go out and take the money off the suckers, and then we will try to protect the suckers through our securities laws."

Oil men should not be lulled into a false sense of se-

curity by proposals to "lighten the burden" of this undistributed profits tax. Oil men should fight any such tax, no matter how small. If the administration wants to reach a few holding companies, if that should be fair, good business and legal, then let it find some way to do it that will not point the gun forever at all business, at small business, because while the gun may not be loaded today, we can all rest assured that some reformers eventually will bring up powder and shot and fire it, if for no other reason than that to let the gun rest idle in the country's "public square" would be an "economic waste".

Furthermore, if it appears to be "sound political policy" to tax the savings of corporations out of existence, how soon might not a tax be aimed at the private savings of the individual? It may yet be argued that it would be "much better" if he put his money in circulation and in his declining years depended upon the government's old age pension, now starting.

The Story of An American Oil Jobber—Warren R. Keith

There died at Brockton, Mass., Jan. 3, a veteran Independent oil jobber who was emblematic and typical of America's numerous average business men, who like to be their own bosses and run their own businesses.

In these days of "big business" and ever growing big bureaucracy it would do us all good to pause and look at the type of business man that has made this country and is its backbone today, including the oil industry in all its branches.

The man who died is Warren R. Keith. He had lived 81, busy, energetic and useful years. His people were among the first settlers of this country and he farmed and lived on some of the land of his forefathers. His schooling was nominal. He had to and did work all his life.

Mr. Keith did many things in the country where he was born and raised. He farmed, cut and sold ice, ran a general store, built roads, was street commissioner and then, in 1907, he became an oil jobber at the age when many men think of retiring. He was typical of thousands of oil men everywhere; ingenious, exceedingly resourceful and never stumped no matter what the odds.

Mr. Keith, perhaps because he had long legs and liked to keep on the move, made the first modern use of a truck's ability to haul distances at good speeds, that I saw in this oil business.

Up to this time, 20 and 25 years ago, trucks were used for the same job as the horse drawn tank wagon, for door-to-door delivery to consumer and grocery store, only instead of kerosine, the trucks delivered gasoline by buckets to the barrels or underground tanks then found in most private garages.

Mr. Keith maintained that the truck was built to outhaul horse vehicles by speed and distance and that it should be used for its true purpose. The longest practicable hauls at the highest possible speeds were what he wanted. So he went to surrounding towns where he had no bulk stations and secured grocer and garage customers and also large factory consumers. These he supplied by truck from his one bulk station at Brockton, one town one day, another the next, and so on around the circle of towns 20 to 50 miles and more away. He added trucks as he added towns and, when he had enough business in a town he put a bulk station there and concentrated his truck fleet on the other points.

Emphasizing in his mind the need for low-cost transportation was the incoming of the big Cushing, Oklahoma field in 1912, which made Oklahoma and the whole southwest the center of the Independent jobber's gasoline supply and in fact for most of the country as well. Mr. Keith bought much of this cheaper gasoline and "tank-carred" it right through the Pennsylvania refining district to the New England coast.

But that was bound to be an impossible cost later, he felt, and so decided on a marine terminal where big tankers could tie up. No Oklahoma refiner had yet arranged to get much of his gasoline to the Gulf Coast nor to put in tanker service, nor had Mr. Keith the money to buy himself a tanker or two and build a Gulf Coast terminal at which to collect tank cars for cargo shipment.

But he confidently believed the need for such tanker service was so great that it would only be a short time when the Mid-Continent refiners, or some one, would arrange it; so Mr. Keith built himself a marine terminal at Tiverton, down below Fall River, Mass., and a dock to which big seagoing tankers could tie up. He was the first jobber to have his own terminal of that kind. In fact he was way ahead of the parade, ahead of some of the big companies and a little ahead of economic forces, for the demand for gasoline up the Mississippi valley increased so rapidly that relatively little of the Oklahoma gasoline went to the Gulf for coastwise shipment. However, Mr. Keith found other sources of tanker gasoline supply and trucked it himself from this deep-water terminal.

When the war came Mr. Keith's son enlisted and left the father, then 61, fearful that he might not have the health to keep up with the business while the son was gone. He also realized that the Allies' need for gasoline might leave his marine terminal and business high and dry for gasoline. So he sold out to the then newly-organized Sinclair Oil Corp.

The son returned from the war a brigadier general and went back into the oil business as the Keith Oil Co., still operating at Brockton. The father never became active in the business again but kept his eye on it for years.

This story of Mr. Keith is the story of the shrewd American ingenuity that is found all through the oil industry, that looks ahead a few years, moves rapidly with and ahead of events and makes the best use of new inventions and new methods as they come along—in this case the motor truck and water transportation.

The story of these older oil men who have made successes of their business cannot be told too often. The newcomers to the business, young men of little experience in life's difficulties at times appear discouraged at troubles as they arise. They are no greater nor more difficult at present than the troubles the older jobbers met and overcame in their day. It was just as hard for Warren Keith to finance those pioneer trucks of 25 years ago, to finance that first big marine terminal tank of his, as it is for a jobber to arrange to build one of these modern sparkling palaces of service and lubrication these days. I know because the tank builder called me on the phone and commented that Mr. Keith was a little shy on assets but that he had a fundamentally sound story and if it was all true they would take the chance. Mr. Keith got the tank and with it's savings helped pay for it and also paid for his trucks.

When he sold out he thought he might stay with the Sinclair company for a while, to have something to do and help build the New England business because he liked to see things grow. But he was never made to run in double harness, any more than are so many men, as is shown by the big variety of Independent businesses in this country. He quit. He was willing to pull a big load of trouble but he wanted it to be all his trouble. There was more fun and satisfaction in that.

So this is not only the story of Warren R. Keith, but also, I know, the story of a good many thousands of other oil men, too.—W. C. P.

Plane Rushes Ickes' Order to Madison

(*Continued from page* 21)

responsibility, Arnott testified, was not the buying program but on questions raised by the PAB in regard to general stabilization covered in a letter to Arnott of April 22.

Three points in the letter, he continued, were: First, there should be no stabilization meeting without a PAB representative present; second, every element in the industry should be heard before any decisions are made; and third, that no general instructions be given under the authority of the letter of July 20.

In the discussion that followed, Arnott testified, he stated that in line with the July 20 letter he had to make some decision using his own discretion and on these decisions and using his discretion "I was taking the responsibility for them."

Arnott said he did not recall any statement at the May 8 meeting, made by himself or any PAB member that he had no authority under the July 20 letter or under the code for operating a buying program.

Donovan then questioned about a meeting with the PAB May 10, 1935, and reference to buying in the spring of that year. Buying came up in connection with the Blazer report, Arnott said.

Ickes' Order Rushed By Plane

Further questioning about the P. and C. Committee and the Blazer report led to an extended argument. When Lewin touched on the authority of the PAB, stating "there couldn't be any power in a minor, subordinate official of the department of the interior, no matter what title he has," Donovan offered in evidence a copy of the classification of PAB members. The copy had been certified by Sec. Ickes Jan. 5 and rushed to Madison by airplane.

Chaffetz argued that Frey from the stand testified he did not have authority to approve.

Defense Counsel Thomas argued that it did not make any difference what Frey said, but what the secretary of the interior said.

After the jury retired Lewin continued the argument, reading from papers classifying positions of government employes and the "temporary" appointment of Frey to the PAB, effective Nov. 1, 1933. Lewin read about Frey having charge of the statistical group studying marketing costs and problems.

"Now, if you can imagine anything more innocuous or minor than to be placed in charge of statistics, a man who is taken out of a professorship, has had his training in geography and geology and statistics and employed as marketing advisor to the board," Lewin argued. "Not marketing advisor to private industry, but to the board, not even to the secretary."

Lewin continued the argument until the noon recess.

Pennsylvania Data Barred

Judge Stone once more sustained objection to documents on the Pennsylvania situation, as court opened the afternoon of Jan. 6. But the certified document from Sec. Ickes showing Frey's duties and authority, offered by Donovan, was received and the jury returned to the box.

A telegram of May 28, 1935, from Fahy to Arnott was received, noting the end of stabilization and the code and stating "until further word all such activities must be on purely voluntary basis without any sanction from administrator."

"Did you believe that the PAB and particularly Dr. Frey were co-operating with you in your buying activities?" asked Donovan, and Arnott replied, "I did."

"Now, I ask that this answer be stricken," said Chaffetz, "and I ask that the witness be instructed again not to answer a question until government counsel has a chance to object."

The court said, "I think the witness ought to give government counsel a chance to object, but in this case the objection is overruled."

Arnott testified he would have discontinued activities if he believed that Dr. Frey or the PAB disapproved or had been told to do so by the PAB or Dr. Frey.

Arnott declared that "in my mind there was no doubt" that the PAB and Dr. Frey were authorized by the Secretary of the Interior to deal with stabilization of both wholesale and retail markets throughout large areas in the U. S.

"Because it would be helpful in my work," said Arnott in reply to a question as to why he had obtained a legal opinion from Louis Titus, P. and C. Committee counsel, on the July 20 letter.

Ickes' Letter Barred Again

The July 20 letter was again offered in evidence at this point, and again was barred.

One retailer meeting another retailer's price cut is part of a "war", Arnott replied to the court's request for a definition of a price war; but "you cannot consider a price war from the retail end only," he added.

Because of the very close inter-relationship between the wholesale and retail markets, "you can't deal with one without dealing with the other—no matter which end you begin with," Arnott said.

Donovan then read to the jury a press release on Ickes' remarks to the P. and C. Committee on Sept. 18, 1933, on establishment of the PAB in which the oil administrator said that "our task is to stabilize the oil industry upon a profitable basis."

Frey's Authority

Next, the chief defense counsel read from Interior Department records what were the duties and authority of Dr. Frey and the PAB.

On Jan. 10, 1935, Frey was given "unusual latitude for independent and unreviewed administrative and executive action and decision, to serve as a member of the PAB with direct responsibility for the marketing division of the board, with full responsibility for the success or failure of the duties assigned to him; and to perform related work as assigned," according to the documents read.

As a personal representative of the administrator Frey was "to negotiate and sit with committees of those engaged in the stabilization of wholesale and retail markets throughout large areas of the U. S."

Donovan read Ickes' letter of July 25, 1935, noting the end of the code work and thanking Arnott for his service.

Chaffetz Examines Arnott

Cross-examination by Chaffetz started with a letter from Sec. Ickes to Arnott, of April 2, 1935, being read to the jury by the government attorney.

The letter mentioned a PAB report on a dealer moratorium in the Chicago area, stating also "that the temporary character of a number of situations and the need for immediate action has made formalized agreements impracticable.

"However, when the understandings arrived at a basis of solution of price wars affecting the industry over a considerable area are intended to operate over a definite period of time or involve substantial changes in the policy of the various supplying companies made only in consideration of similar action on the part of other companies, it is necessary that the procedure required by the recovery act be followed in order that the arrangement be legal."

Replying to Chaffetz, Arnott said his salary with Socony-Vacuum was $85,000 annually as president and continuing for some 18 months after he became a vice-president in 1933. Then the salary, along with other executive salaries, was cut to $60,000, he added.

Socony-Vacuum's midwestern sales of all products were about 100,000,000 barrels annually, Arnott said.

Questioned about a meeting allegedly held June 7, 1934 in Chicago and appointment of a committee on jobber contracts, Arnott said he did not recall the June 7 meeting or the companies represented.

Stabilization Meetings

Turning to the December, 1934, stabilization meetings in Chicago Chaffetz asked, "Didn't you at that meeting agree with those other major company representatives with whom you were meeting upon a uniform jobber contract to prevail in the Standard of Indiana territory for the succeeding year?"

Objection was sustained and Chaffetz withdrew the question. The court instructed the jury to disregard the question.

Questioned about Dr. Frey not going into the Feb. 25 meeting, Arnott said he asked Frey, if under the circumstances, " 'do you think it is wise for you to come in?' He was perfectly welcome and he knew it. He said, 'I agree; it wouldn't be wise for me to be there if you want this free expression.' "

Examination then turned to the March 15 meeting in New York and why Buckley and Robinson were invited out of the meeting. Arnott testified he wanted a free and open discussion, and as Buckley and Robinson represented refiners who had not been co-operative under the code they were excused.

Ickes' Letter On Arnott's Desk

"Where would you keep the letter of July 20 to you from the secretary," asked Chaffetz, after being told that Arnott's correspondence was handled by the company's file department.

"Ah! Right on my desk," Arnott replied.

Arnott testified correspondence which came under the subpoena served on the company was in custody of the company.

"A subpoena to your company would produce it quick?" asked Chaffetz, after some questions about correspondence in the summer of 1935 with Buckley said to concern Ar-

(*Continued on page* 26)

Producers Seek More Refineries For Montana

Turner Valley Takes Canadian Markets

By LAWRENCE E. SMITH
N. P. N. News Bureau

TULSA, Jan. 8.—After several weeks of conferring and planning, oil producers of northern Montana who are without market for their crude are little better off than they were. Numerous properties are shut in and there is no certainty that anything will develop to give them outlet for some weeks more.

In that part of the world, where consumption is light and winters begin early and last long, a little oil goes a long way. The flow of gasoline has long been from Wyoming to Montana and the crude oil market for Montana was Canada. Refineries at Coutts, just across the border; at Calgary, Regina, Moosejaw and other towns of the western Canadian provinces, drew on the Kevin-Sunburst and Cut Bank fields, near the international boundary, for raw material.

Last year the Turner Valley district of Alberta came to life with a thump that was felt in Montana immediately. Canadian refineries turned to the source nearer to them and left the Montana fields with only such market as the refineries of that state afforded, which is by no means adequate.

Builds Two Plants

The result of the numerous conferences and planning to date is the establishment of two more plants which will give partial relief to the situation. Yale Oil Corp. of South Dakota, which already has two plants in Montana, is building a 1500-barrel plant at Kalispell, which is in the mountain country west of the fields. The Yale company has a plant at Billings to which it is shipping 50.000 barrels of Cut Bank crude on a temporary rate of 17 cents—a reduction of six cents made by the Great Northern railway to be in effect until April.

A plant will be built at Pocatello, Idaho, by Salt Lake City interests. This will be 1500-barrel capacity and it is reported that some Montana crude will be used.

New refineries, however, will not solve the problem, as all those concerned recognize, as there are already a number of plants in Montana. As previously remarked, the flow of gasoline has been from Wyoming, and Montana refineries, generally, have served their immediate trade territory and little else. So, along with other remedial methods, it was decided to cultivate the home market more intensively. Producers recently raised a fund to be spent in urging people of Montana to use gasoline made from Montana crude. It is too early to say whether this is having a substantial effect and it is the wrong time of the year anyway to tell, with consumption at its lowest mark, but auto stickers are being distributed throughout the state calculated to influence the public in favor of home products.

Seek a Major's Aid

Another plan which has received much earnest attention is one which involves the building of a large refinery, capable of taking care of all the distress production, getting some large company either to build the plant or to agree to market the output. Several companies have been approached but no decision has been reported. Producers are said to be willing to contract their crude over a period of years.

There is much discussion with the railroads in the attempt to bring about rate reductions on both crude and products, but aside from the temporary reduction to Billings, no changes have been made. It is argued that additional marketing territory could be opened to Montana oil in eastern Washington, into which considerable California gasoline now moves, and in the Dakotas and possibly in western Nebraska if rates were on a parity with those from Wyoming. Even a little slice of territory now supplied from Mid-Continent could be made available to Montana products, Montana producers said.

Pipeline runs from Cut Bank field properties in November totaled 210.930 barrels, which is about 1000 barrels less than in October, but more than a third of this went into crude oil storage. The Kevin-Sunburst area runs were 104,808 barrels in November—with some going into storage. The rated potential of the field is about double the November figure.

There is no proration in Montana, hence the field situation is a disiointed one. Some producers have a market for part of their production, some for all. The neighbors who lack market try to produce defensively, pumping the offsets. Storage daily grows burdensome to such operators.

There is no state law providing for ratable takings and in a recent hearing held by the five-man conservation board—which is not a statutory body—it was by no means clear that the majority of Montana producers want state regulation. Many of them, even those now in distress, seem to prefer to work the situation out some other way.

Crises have arisen before in northern Montana oil affairs, but this probably is the most acute. It is all a question of finding a place for something less than 15,000 barrels of oil daily. That doesn't sound like much in the Mid-Continent, but in northern Montana and western Canada it goes a long way. Just the running up of 12,000 or 13,000 barrels daily in the Turner Valley field of Alberta was enough to bring on all the trouble.

Imperial Expands In Turner Valley

TORONTO, Jan. 8.—Imperial Oil, Ltd., is spending $500,000 and $350,000 in increasing the facilities of its refineries in Calgary and Regina, respectively, to take care of the increased crude production of the Turner Valley field in Alberta.

The new facilities together with reduced freight rates on crude will make it possible to market refined products made from Turner Valley crude as far east as Rainy River, Ontario, it was said. Heretofore Ontario points have been supplied by the Sarnia refinery.

R. V. Le Sueur, vice president of Imperial Oil, stated that his company had first considered building a pipe line from Calgary to the refineries at Moose Jaw and Regina, but negotiations with the railways had later resulted in reducing the railway freight rate on crude from Calgary to Regina from 75.6 cents per barrel to 53.2 cents in train-load lots. The Consumers' Co-operative Refinery at Regina has asked the railway board to make the lower rate applicable also to car-load lots.

Britsh American Expands

TORONTO, Jan. 8.—British American Oil Co., Ltd., will add to the operating units of its refining plant in Montreal at a cost of approximately $500,000.

Tiona to be Sold By Court Order

CLEVELAND, Jan. 10. — Physical assets of the Tiona Refining Co. must of necessity be sold, H. W. Walchli of Clarendon, Pa., president, said today, since the company will be unable to meet indebtedness by the deadline tomorrow night.

U. S. District Court for Western Pennsylvania has ordered the plant and equipment of Tiona sold in default of $132,000. Unpaid bonds represent $112,000 of this amount. Three years back taxes total $3200. Interest and premiums due bondholders make up the balance.

Richfield Oil Co. of New York, holder of a $261,000 mortgage on the Tiona refinery. Walchli said he purchased the controlling interest — 75 per cent—at a nominal amount. The plant represented an investment of $1,400,000.

Tiona struggled under a $700,000 issue of 8 per cent bonds since 1920, Walchli said, retiring them at the rate of $50,000 per year until 1935.

In that year prices declined below 1933 levels on many "lube" stocks and Tiona decided to stop operating. Pennsylvania refiners point out today that prices of "lube" stocks are below those of 1935.

Tiona issued the bonds to rebuild its plant after a fire in February, 1919.

At the same time Federal Judge Robert M. Gibson ordered sale of Tiona he filed an uncontested decree against the Richfield Oil Co. of New York, restraining it from collecting on a $261,000 mortgage.

Contract Is Awarded For Idaho Refinery

DENVER, Colo., Jan. 10.—Contract for construction of a 1500-barrel combination skimming and cracking plant at Pocatello, Idaho, has been awarded by a group of Salt Lake City oil producers and refinery operators to Alcorn Combustion Co., according to reports here.

The plant will be a T.V.P. unit, and will process crude from Montana and Wyoming fields. Chief source of supply being Cut Bank. Railroads are reported to have made a special rate from that field to Pocatello. The products will be marketed principally in Idaho.

Argues With Chaffetz Over Questions

(*Continued from page 24*)

nott's wanting a report on East Texas refiners increasing runs.

Tangles With Chaffetz

"Why, of course, if it is there," Arnott replied. "I don't see why if you issued a subpoena, you didn't get it before."

"I don't either," Chaffetz replied. "That was what I was trying to find out."

Chaffetz questioned about an independent refiners meeting in Kansas City, Oct. 14, 1935, and a discussion of a "major company buying program." Arnott could not recall any such discussion while he was in the meeting.

Cross-examination continued at the Jan. 7 morning session, with Arnott testifying he did not have a discussion, or a telephone call from Buckley in April, 1936, after the grand jury subpoenas were issued.

At an independent refiners meeting in Kansas City, Nov. 25, 1936, Arnott testified he was not present during any discussion of the "buying program," and attended the meeting on the proposed code.

After testifying he did not know if a "buying program" was going in late 1935 Arnott was asked to tell the difference between buying programs before the NRA code expired and what went on afterwards.

"The only difference I can say is that there was no stabilization in respect to anything that I had to do or that the PAB or the government had to do," Arnott explained. "It was entirely a matter as to what anybody wanted to do in a voluntary way, and entirely on their own, having had the supposed approval. . . .

"Before the (end of the) code they had what I felt was a recommendation and a suggestion they put it into effect, Mr. Chaffetz, and after the code they had no approval, they had nothing from me whatsoever, and anybody who bought gasoline, he did it on his own."

"Otherwise the functioning of the thing was identical after the code as it was before?" asked Chaffetz.

"I don't know as I know very much what the committee did after the code," Arnott replied. "I did not keep in touch to find out; it was not a matter that I was concerned with."

Asks Question Be Clarified

During the cross-examination Arnott several times asked for clarification of terms and words in the original question.

After some questions about Clyde Boggs, Kanotex Refining Co., continuing after the code as chairman of the executive committee for independent refiners and Arnott's contacts with Boggs, Arnott said to Chaffetz:

"I would like to point out to you, sir, you haven't developed what I did do."

"I have developed all I want to develop, and I will continue my examination in my own way, without suggestions from you," Chaffetz replied.

"Very good," said Arnott.

"Your own counsel will ask you any further questions that are necessary," the court said.

"The only point, your honor, is that he develops a point and makes a statement, and doesn't give me a chance to develop the facts," said Arnott.

'Smart Enough To Know'

"I ask that that remark be stricken," said Chaffetz. "He is smart enough to know that such a statement as that is out of place."

"Your counsel will ask you any further questions," said the court.

Examination then turned to the Gulf situation. Arnott testified he knew orders were being placed but "by whom or in what quantity, or when, I didn't know a thing."

Arnott denied knowledge of meetings allegedly held by representative of major companies and independent Gulf refiners to stabilize tank car and barge rates along the East coast.

About the January, 1935, tank car stabilization situation, Arnott testified he could not think of a reason why distress gasoline in the Mid-Continent was not purchased. Distress gasoline was legitimate gasoline and major company buying, whether or not major companies needed the gasoline, would have helped independent refiners in January and February, 1935, he said.

"But the way you wanted to help the independent refiners was by raising the published tank car price for gasoline in the Mid-Continent; isn't that right?" asked Chaffetz.

"No," replied Arnott.

"You deny that explicitly?" Chaffetz asked.

"As you say it, explicitly," Arnott replied.

Chaffetz then read from a letter to L. L. Marcell, White Eagle executive, from Arnott, of March, 1935, about "the outlook is good and if we can hold it together, as I think we can, there ought to be a real improvement in the tank car refinery price."

"The purpose I had," said Arnott, "was to bring the independent refiner into a position where he had an allocation of a quantity of gasoline that he could make, and when he made that gasoline and had no market for it, that was distress or homeless; that, first, he would have a normal demand for that product; that that demand wouldn't be artifically created by dumping it on the market; and the most essential thing was that he, in his location, he, with the quality of his product, he, with the quantity that he had, would be recognized by buyers who were interested in all of those.

"And if you could not find people who normally and properly, in connection with their allocations, could buy that product, a matter of price was of no consequence.

"The independent refiner had no place in the industry, and this was an endeavor, Mr. Chaffetz, to give him that place, where he would fit in with his product in the demand for his gasoline, and it would be a normal, proper, recognized demand."

Mid-Continent Situation

After questions about Mid-Continent refiners producing more gasoline than was purchased as surplus, and about the allocators' meeting March 13 in Washington, returned to the Mid-Continent situation.

Arnott testified if independent refiners did not co-operate, but tried to increase their business by price shading, they would have ruined their market. Companies might have bought surplus gasoline at the reduced price, he said.

Chaffetz asked about major companies not buying in January and February, 1935, although the quantity of distress gasoline was the same as in March "and if they were each buying only what each of them wanted to buy and needed, they would have bought it in January and February as well as March—I thought we had agreed on that."

"We have agreed on that as to your assumption of what the majors would have done, but you haven't asked me what I did," Arnott replied. "You have talked about what the majors would have done. I am not able to tell you why the majors did this or that. You haven't asked me why I didn't do something about it earlier. Is there anything more you want to say—"

"Now just a minute, in January and February—" began Chaffetz as spectators in the courtroom laughed.

Nothing Funny, Says Judge

"There is nothing so funny about this," Judge Stone remarked.

"I don't mind that sort of thing," Chaffetz commented.

"If there is anyone in the audience that just wants to laugh, step out in the hall," said the court.

"This is no funny matter to me," said Arnott.

"Or for the court or jury or witness, or for counsel," said the court. "If you came here to laugh and enjoy yourselves, leave the courtroom, we don't want you here at all."

Chaffetz then led up to a question as to Arnott's opinion on major companies buying all the distress gasoline in the Mid-Continent area in March if the majors did not believe the published tank car market would go up as a result of the buying.

"That would only be one factor, and by no means the whole," Arnott said.

"I would like an answer to that question," said Chaffetz.

"As you ask it, no," Arnott replied.

Arnott Names Buyers

Arnott then was asked to name companies he knew were buying in the Mid-Continent program. He named Indiana Standard, Socony-Vacuum, Sinclair, Phillips, and he thought buying was done by Pure Oil, Mid-Continent Petroleum, Globe and Deep Rock. Arnott then listed executives with these major companies with whom he discussed buying in 1935-36.

Arnott was then asked to name companies to his knowledge participating in major company buying in East Texas. Arnott named Sinclair, Gulf, and he thought Cities Service and Tidewater bought. Arnott then was questioned on what men in these companies he discussed the subject of buying.

As the court session was nearing an end the court received in evidence a letter from Marcell to Arnott, of March 12, 1935. Objection was overruled.

The letter referred to retail prices holding up and "The buying program seems to be stimulating the gasoline tank car price, and the outlook is more hopeful than it was two weeks ago when I left for Mexico City."

Court adjourned Friday noon to Jan. 10.

Marcell-Arnott Letter

As the trial resumed Jan. 10, a letter from Marcell to Arnott of March 27, 1935, was received in evidence. Declaring that the then-current price of third grade gasoline was "just about the cost of manufacture," the letter said "so, if these prices

Chaffetz Puts In Ickes-Arnott Letter

can be strengthened a half per gallon it will mean quite a substantial profit for us."

The court reserved a decision on the request of Charles I. Francis, Pure Oil attorney, that the Marcell letter not apply to any other defendant except Socony-Vacuum.

Then came the highlight of the morning session.

"If the court please," announced Chaffetz, "there has been so much discussion about this letter (July 20, Ickes to Arnott) that we are inclined to waive objection and offer it, so that it will be in the record."

"It may be recorded," said the court. Chaffetz began reading the letter to the jury, which the government had successfully objected to throughout the defense side of the case.

April 2 Letter

Chaffetz then questioned Arnott about the April 2, 1935 letter from Ickes to Arnott as linked with the July 20 letter. Arnott testified the April 2 letter referred to a different subject — moratoriums.

On redirect examination Donovan questioned about what Arnott heard on Secretary Ickes' address at the Dallas A. P. I. meeting, November, 1934. Arnott said:

"I recall a statement made by the secretary in regard to a buying program that had been instanced by the members of the PAB and the assistant to the secretary which had to do with the buying of all the gasoline of independent refiners in East Texas, and that this program involved not only the buying of all that gasoline but also probably involved the buying of "hot" gasoline.

"Quite a dispute arose between members of the PAB who were in Texas and the members of the Department of Justice who were down there as to the legality of any such buying that had to do with all the gasoline of these refiners, and also the legality of buying 'hot' gasoline, and the secretary made the statement that he would not approve any such buying program."

Collett Takes Stand

J. D. Collett, chairman of the former P&C committee, now an independent producer at Fort Worth, was the other witness during the morning. Objection was sustained to a series of questions about discussions with Dr. E. R. Lederer, Coates and Buckley on the East Texas situation, also to questions about the PAB's attitude on buying activities.

On refinery allocations Collett testified "they were effective to an extent, but not entirely satisfactory, because of the 'hot' oil and excess gasoline coming out of East Texas. They had been able to hardly maintain a fair level, a reasonable level of prices as compared to the volume of oil and gasoline that was coming out. But it was totally ineffective as to getting a proper price, on account of the excess oil and gasoline that was coming out of East Texas. That was the surplus that was being put upon the market, your Honor, that disturbed the whole situation."

Gray Testifies

The January 10 afternoon session opened with David G. Gray, manager of Waggoner Oil & Refining Co., Electra, Texas, from 1931 until late 1935.

During Gray's examination, testimony given by C. O. Beroth, of Chicago, Acme Petroleum Co., as a government witness was brought up, concerning Beroth's statement that in 1935-36 his company could not get quantities of gasoline needed from Waggoner as Waggoner was in a so-called major buying program.

Acme's purchases in 1933-34 were five or six cars a month, usually in one car orders, Gray testified. Gray said his experience with Acme while he was with Dale Oil & Refining Co., before joining Waggoner, was "unsatisfactory". After joining Waggoner, Gray testified, "I sort of put a ban on Acme."

Asked to explain "unsatisfactory experiences" with Acme Petroleum, Gray testified:

"Selling a product, we will say 10 cars of material, for shipment over a balance of a month, or maybe two months, at an agreed price, or on an agreed price basis; and the market going against the purchaser, and their not furnishing shipping instructions on the material, causing us to seek another market for it —our outage claims were always excessive."

Gray also testified that in 1934 Waggoner made an exclusive brokerage arrangement for Ohio and Illinois with American Petroleum Co.

Gray testified to Waggoner selling gasoline to the Indiana Standard at a flat price over a period, up to 30 days, but denied selling, as charged in the indictment, to a "dancing partner" at a "high, arbitrary, non-competitive price."

Weymouth Kirkland, Indiana Standard counsel, conducted the direct examination, Ralph Horween, counsel for A. V. Bourque, also examined and Gray testified that Bourque, in putting Waggoner in touch with sellers, was not acting as a buyer, seller or as an agent for Waggoner.

Chaffetz, in the cross-examination, introduced in evidence a telegram from Gray to Bourque, on July 10, 1935, mentioning sales to Barnsdall, Pure Oil, Indiana Standard and Continental Oil and referring to selling to the "group". Gray said "group" referred to the four refiners named.

Also introduced in evidence was a letter from Dale W. Moore, Tulsa broker, of Oct. 2, 1935, saying "The Group" informed Moore that Waggoner needed no further help. Gray testified he did not know who "The Group" were, and that Moore's distress gasoline was Moore's and not Waggoner's.

Stipulations entered by Donovan were for gasoline production and sales, 1934-36, for Kickey Oil & Refining Co., Panhandle Producing & Refining Co., and Wilcox Oil & Gas Co.

Ickes To Lientz

A letter written by Secretary Ickes March 30, 1935 to B. P. Lientz Co., Kansas City, was received in evidence intended to show Ickes' "Knowledge" of buying.

"It is my understanding that at present the activity of the stabilization committee is having a distinct effect in the improvement of refinery prices," said the Ickes' letter after referring to plight of the independent refiner.

Night Session

At a night session Jan. 10, offers of proof were made by Donovan on admissability of the legal opinion by Titus on the July 20 letter. The court sustained objection to receiving the opinion in evidence.

James D. Miller, chief accountant for the defense, was recalled to the stand Jan. 11. Miller testified on government figures already in evidence on purchases in the Mid-Continent by defendants compared with *Platt's Oilgram* and Chicago Journal of Commerce price quotations, for March 1, 1935, through April 30, 1936.

Errors in government figures, Miller testified, were due to including gasoline that was not motor fuel, clerical, using the wrong refinery f.o.b. point, and in the comparisons of sales and publication prices.

Miller testified on errors in government statistics on purchases by Barnsdall, Skelly, Socony-Vacuum, Empire Oil, Pure Oil, and Globe during the morning session.

Major Company Purchases

At the Jan. 11 afternoon session Miller continued to give figures checking government statistics, with an analysis of Mid-Continent purchases by Phillips Petroleum Co.

In practically every instance of major company purchasing, where the price was over the low of trade publications, it was accounted for by freight rates on unusual specifications of material, Miller said. None of the defendant companies ever paid over the low, when buying on a price publication basis, except for five cars both in April, 1935, by Globe from Cushing when Globe's Blackwell refinery was shut down, he added.

Ralph Horween, Globe counsel, then submitted stipulations and charts, received in evidence, showing shipments, purchases of finished gasoline, and inventories for Globe from 1931 through August, 1937.

Francis put in evidence data on Pure Oil's gasoline purchases from Eason Oil Co., and Omar Refining Co., named in the indictment as Pure's "dancing partners." Of Eason's total gasoline sales in 1935, Pure bought 6.4 per cent, while in 1936 Pure bought 5.34 per cent. Of Omar's total 1935 gasoline sales, Pure bought .77 per cent; and 5.03 per cent in 1926.

Miller testified that the total amount of gasoline produced by independent refiners in the Mid-Continent named in the indictment, except Taxman, was 295,154,204 gallons in 1934; 356,862,132 gallons in 1935; and 397,780,076 gallons in 1936.

Production in 1935 increased almost 21 per cent over 1934, and 1936 production increased about 11.5 per cent over 1935, Miller testified; 1936 production was over 30 per cent greater than in 1934, he added.

Gasoline production by 12 independent Mid-Continent refiners named in the indictment, Miller testified, was: 1934—659,933,992 gallons; 1935—774,350,817 gallons; and 1936—868,156,624 gallons.

Production in 1935 increased about 17 per cent over 1934 while 1936 production was about 12 per cent over 1935.

Miller testified independent refiners named in the indictment (as having curtailed gasoline production) increased production more than other Mid-Continent independent refiners, and more than the increase in mid-western gasoline consumption.

Court recessed until Jan. 12.

Mid-Continent SKYLINE

By LAWRENCE E. SMITH, N. P. N. Tulsa News Bureau

TULSA, Jan. 8

Some re-alignments are under way in East Texas in crude oil purchasing and transportation. The latest is the purchase of the field gathering system of the Root Refining Co. by the Empire Pipe Line Co. The system is connected to 165 wells and gathers about 3300 barrels daily.

Root formerly moved this oil through Atlas Pipe Line Co. into the Shreveport district, but the development of supply closer to its El Dorado (Ark.) refinery made it unnecessary to continue purchases in East Texas.

The other and previously reported change involves the Bell General Pipe Line Co., which was set up by Bell Oil & Gas Co. and the General American Oil Co. some two years ago. The McMurray Pipe Line Co. gathering lines and trunk to Tyler have been taken into a new corporation known as the Bell General Transit Corp. About 16 miles of eight-inch line will be laid from Tyler to connection with the Pure Oil Co. line from the Van Field to the Beaumont district.

* * *

Kansas Producers Visit

The executive committee of the recently formed Kansas Independent Oil & Gas Association, including President E. B. Shawver and Executive Manager H. A. (Hub) Meyer, conferred in Tulsa Jan. 5 with representatives of companies that buy Kansas crude oil.

The meeting was devoted to discussion of the market for crude oil as it affects Kansas. The state Corporation Commission put into effect an increase in allowable for January but this was nullified by Phillips Petroleum Co.'s announcement that it would buy 80 per cent of the current allowable from its connections and by Stanolind Crude Oil Purchasing Co.'s statement of its purchasing program, 85 per cent of the current allowable from Ellis County connections.

The group of Kansas producers who visited Tulsa told of their desire to enlarge their markets, heard from purchasers expressions of willingness to buy more oil whenever that could be done without undue burden. At this time they are taking all they can use.

* * *

Delaware Officials in Texas

Because Secretary of State Ed Clark, Texas, recently announced that he would not renew permits of "tramp" corporations — meaning companies chartered in another state with intent of doing business only in Texas, the Delaware secretary of state and the tax commissioner visited Mr. Clark in Austin last week. Outcome of the conference was not announced.

Clark recently made public a list of more than 300 corporations which he said were doing business only in Texas but held foreign charters. Many of them were Delaware corporations. The difference, to Texas, is in the license fees.

* * *

Here and There

The booming K. M. A. field, on the Wichita-Archer county line in north Texas, was the subject of operating rules issued last week by the Texas Railroad Commission. Ten-acre spacing of wells was ordered, but allowable production will be based on 20-acre units with 50 per cent of the allowable credited to acreage and 50 per cent to potential flow. The maximum potential allowed is 500 barrels daily per well.

Auction of oil leases on Osage Indian lands will be held in Pawhuska, Okla., Jan. 26. Offerings will consist of 243 tracts totalling about 50,000 acres. An unusual feature is that 25 of the tracts will consist of 640 acres each. Custom always has been to sell leases on 160 acres or fractions thereof.

Col. Ernest O. Thompson, member of the Texas Railroad Commission, made formal announcement a few days ago of his candidacy for the Democratic nomination for governor. He is the first in what is expected to be a sizable list of candidates for this post.

Osage Oil & Gas Lessees Association re-elected all officers at its annual meeting in Tulsa. They are: Hayes McCoy, Cities Service Oil Co., president; W. P. Z. German, Skelly Oil Co., vice-president; Clarel B. Mapes, Mid-Continent Oil & Gas Association, secretary-treasurer.

Texas now owns Pike's Peak and the Lone Star flag should be on the summit come tourist season. In the New Year's day football game in Dallas between Rice Institute and the University of Colorado — the Cotton Bowl affair — Governor Allred, Texas, wagered his state's Big Bend park against the famous mountain. Governor Ammons, Colorado, thought well enough of his team to enter into the gamble.

News of the death of Clay J. Webster, widely known oil man, in San Antonio on Dec. 31 was received by Tulsa friends. He was 59 years old. He turned from banking to oil about the time of the Ranger field development and has since operated in Texas and Oklahoma.

How Big, Bad Corporations Can Gain New Deal Sympathy

(A Letter to the Editor from Ellick Botts, Consulting Pumper of Grayhorse, Okla.)

To the Editor:

I take my cue from events of the past few years and the recent speeches of the President and some of his official entourage and write you to make a suggestion about improving the understanding and sympathy which the oil industry receives at the hands of state and national officers.

As you may have sensed, the little man in business anywhere is the object of tender solicitude, especially in election year. There was a time when I was growing up and forming my political philosophy through listening to the crowd around the hardware store when a man who had worked himself into a job that paid a pretty good salary was considered a leading citizen and usually he was sought out to teach a class in the Sunday school. The office seekers always called on him first and tried to get him to sit on the platform when they made speeches.

It is all different now. No candidate would be seen openly talking to a man who was known to own property, free and unencumbered. Why, right in my own community one of the aspirants to the post of county weigher, subject to the Democratic primaries, was invited to Sunday dinner by the president of our bank. He accepted but showed up at the back door disguised elaborately as a rug salesman and persuaded his host to pull down all the shades. It just isn't safe to be acquainted even with a farmer any more unless he is facing foreclosure and public sale of his personal effects.

Now, I have noticed in the oil country that the legislators and the tax people are more impressed currently and for several years past by what we call a stripper well operator. One of him outweighs the entire Standard group of companies. Governors give him audience readily and want to know how the family is doing. He is permitted to pop up and testify at all the proration hearings without being sworn.

Now, I think the thing to do is to create a lot more stripper well operators. One reason why they are listened to attentively aside from the fact that they are not economic earls or barons is that they are able to speak up on all occasions without taking it up with the board of directors and having somebody issue a formal statement. They have great flexibility, except financially, and they fear nobody.

So, what we need in the oil business to balance off things with all the other contending elements, such as labor, agriculture, coal mining, etc. is more stripper well boys. Now, the big companies have a lot of stripper wells, but they are given no credit on the books for owning such properties and if they venture to place their economic borderline operations on display before the legislators or the tax collectors all they get is a good bawling out on account of having paid a dividend last quarter, same proving that they made some money somewhere and can afford to lose on the small wells.

What I propose is some kind

of application of the Iowa plan to stripper wells that are owned by large companies. It is quite possible that the big company would make as much by sharecropping the lease as it now does and it is also possible that the man who took it over and graduated from the rank of pumper to that of producer would better himself, as he wouldn't have a lot of overhead in the form of geological, geophysical, land department and general office expense to hang on to each barrel of oil.

Now, I don't want this turned over to some committee for study, for I am certain that the longer it is studied the more involved it becomes. I am just planting a sandbur hoping it will sprout an oak. Incidentally, with my practice suffering from the recession and the cold weather, I am in position to take on a few stripper leases myself.

Yours truly,
Ellick Botts,
Consulting Pumper

Lower Receipts From 'Gas' Tax Seen By Budget

N. P. N. News Bureau

WASHINGTON, Jan. 10. — Federal gasoline tax collections during the fiscal year 1939, beginning next July 1, will be $201,000,000, it is estimated by the Treasury Department, whose figures were included in the President's budget message to Congress.

This estimated income is based on continuation of the 1 cent per gallon tax which was continued for two years by the last regular session, and is $5,000,000 below the revenue which last January's budget estimated the tax would bring in during the current fiscal year. It is, however, about $4,500,000 above actual receipts during the last fiscal year.

No reason was given by the Treasury Department for estimating receipts for the coming year below the figure for the current year, except that it said it expected a small decrease in revenues from most of the manufacturers' excise taxes during the coming year due to business conditions generally.

A similar decrease is foreseen in receipts from the federal lubricating oil tax—from $31,400,000 estimated for the current fiscal year to $30,200,000 during the next. Receipts from this tax last year were $31,463,002.

The Treasury estimated receipts from the tax on transportation of oil by pipelines at $10,300,000 for the coming fiscal year, compared with an estimate of $10,500,000 during the current year, and actual receipts of $11,244,095 in the last fiscal year.

Although it is understood the House tax subcommittee has recommended repeal of the several "regulatory" taxes on production and processing of crude oil, the Treasury has estimated receipts from these taxes at $860,000 for the coming year, compared with an estimate of $870,000 for the current year and actual receipts of $894,182 in the past year.

All these estimates are predicated on continuance of the taxes at present rates.

$285,000 for Connally Law

In his budget message President Roosevelt recommended appropriation of $285,000 for the Petroleum Conservation Division of the Interior Department during the coming fiscal year for administration of the Connally "hot" oil law. This is the same amount that was appropriated for the current year for this activity.

The President estimated highway expenditures in 1939 at $140,000,000, which is a slash of about one-half in federal road expenditures under this year.

An increase of $209,000 is recommended in the budget message for activities of the anti-trust division of the Justice Department. The appropriation for the current year's work was $472,000. Of the increase, $149,400 is recommended "for the employment of special assistant attorneys in anti-trust cases." Attorney General Cummings had asked for an additional $1,000,000 for his anti-trust division.

Crude Stocks Increase

N. P. N. News Bureau

WASHINGTON, Jan. 10. — Stocks of crude petroleum increased 253,000 barrels during the week ended Dec. 25, on which date they were 303,294,000 barrels, the Bureau of Mines reports. Stocks on Dec. 26, 1936, were 288,517,000 barrels.

Stocks by grades, showing changes during the week of Dec. 18-25, 1937, follow:

Grade of Crude	Dec. 18	Dec. 25	Chge.
Penna. grade	4,250	4,275	+ 25
Other Appal.	823	823	...
Lima-N. E. Ind.-Mich.	886	936	+ 50
Ill.-S. W. Ind.	9,712	9,709	— 3
N. La.-Ark.	8,418	8,355	— 63
W. Tex. and S. E. N. Mex.	31,236	31,672	+436
East Texas	24,685	24,095	—590
Other Mid-Con.	126,872	126,604	—268
Gulf Coast	24,526	24,736	+210
Rocky Mt.	23,706	23,826	+120
Calif.	25,685	25,855	+170
Foreign	3,292	3,408	+116
Tot. rptd. wky	284,091	284,294	+203
*Unreported	18,950	19,000	+ 50
Total stocks	303,041	303,294	+253

*Estimate.

New Bill Hits Roosevelt Plan To Cut Federal-Aid Road Fund

N. P. N. News Bureau

WASHINGTON, Jan. 10. — A bill to continue for the next two fiscal years federal-aid highway policies in virtually the same form as at present has been introduced in the House by Chairman Wilburn Cartwright (Okla.) of the House Roads Committee, despite recommendations of President Roosevelt that federal road funds be slashed as an "economy measure."

The President sent a special message to the extra session of Congress in November asking that they cut the road appropriation, but no action was taken. In his budget message of last week the President again recommended that federal-aid money be curtailed.

However, in introducing his new bill (HR 8838) Cartwright told the House: "I am a strong advocate of economy, but believe reductions should be made in all agencies of the government, and not just make roads the goat."

Cartwright's bill authorizes appropriations of $125,000,000 for primary roads for each of the fiscal years 1940 and 1941; $50,000,000 for each year for grade-crossing elimination; $25,000,000 a year for secondary or feeder roads, including farm-to-market roads, rural free delivery roads, and public school bus routes; $10,000,000 a year for parkways to national parks; $14,000,000 a year for forest highways; $2,500,000 a year for roads through other public reservations; $7,500,000 a year for roads, trails and bridges in national parks, and $4,000,000 for roads in Indian reservations.

These sums are substantially the same as those appropriated for the current year, and authorized for the fiscal year 1939, beginning July 1, 1938.

Would Cancel Authorizations

In contrast, the President's budget message made no recommendation for any appropriation to cover authorizations for the next fiscal year, and his earlier message urged Congress to cancel these authorizations and make subsequent annual appropriations for all roads not in excess of $125,000,000 annually.

For the coming fiscal year he recommended appropriation of $100,000,000 as a part of the general public works program for liquidation of obligations to states under authorizations for the current year, and in addition the budget estimated that approximately $40,000,000 would be spent on roads during the coming year from the "recovery of relief fund."

Since this $40,000,000 probably would have been spent anyway, the budget proposal of a $140,000,000 expenditure during the coming fiscal year for roads is about half what would be spent under a continuation of the present federal-aid set-up, as contemplated by Cartwright as well as the federal-aid laws already enacted.

Another feature of the President's proposal was elimination of those provisions of law which make it mandatory on the Secretary of Agriculture to make apportionments to the states of federal-aid authorizations for the coming fiscal year (to be matched dollar-for-dollar) by Dec. 31 of the preceding year. Also, the President wants to repeal the clause which makes such allotment to the states a contractual obligation on the federal government.

Cartwright did not even call his committee together to consider this request, but said he will hold hearings on the bill which he has introduced.

Secretary Wallace already has made the allocation of funds under authorizations for the next fiscal year, as the law required, but in so doing he wrote the governor of each state not to submit any projects under the allotments until Congress has had time to consider further the request that the authorizations be cancelled. It is doubtful if they will.

Secondary Road Program

The authorizations for the next fiscal year mark the beginning of the second year of the federal government's first permanent program of aiding in improvement of secondary roads. Provision for this secondary road work was made by the second Hayden-Cartwright Act, passed in 1936, which made secondary road improvements an integral part of the federal-aid system—unless the Roosevelt "economy" recommendations prevail.

No figures are available as yet concerning the first year's operations under this secondary road program. However, at the time it was launched, it was pointed out that it would doubtless result in construction of many miles of roads using oil and bituminous surfaces.

Oil Firms Close 3 Plants, Seek Show Down in Mexico

BULLETIN

NEW YORK, Jan. 11. — Parent companies of Mexican subsidiaries reported late today that El Aguila, Royal Dutch Shell subsidiary, had resumed operations at its Tampico refinery. The Standard Oil Co. of New Jersey and Sinclair plants are still closed. The three plants shut down Jan. 3 as labor difficulties came to a showdown between foreign oil companies and the Mexican government.

* * *

N. P. N. News Bureau
By S. D. CLARK

CLEVELAND, Jan. 10.—A long-standing dispute between foreign oil capital and the Mexican socialistic government moved toward a showdown today with the issue in the lap of the Mexican Supreme Court.

Developments which strengthened the companies' position, according to reports reaching New York, included:

1. Closing of three refineries at Tampico, by Mexican subsidiaries of Royal Dutch Shell, Standard Oil Co. of New Jersey and Consolidated Oil Corp. (Sinclair). These were closed ostensibly for year-end repairs, but it was understood they will not be reopened until current labor difficulties are settled.

2. Oral agreement by the Mexican Labor Board to suspend its award of $12,000,000 annually in increased wages to oil workers until a Supreme Court decision.

The labor board award required companies to pay wages for 11 days during a strike in May and June on or before Dec. 31. It also required the companies to pay the difference between actual wages and new wages for the past six months on or before Jan. 3. This bill would amount to some $6,000,000, it was stated.

Two Main Issues

Directly or indirectly, two main issues are contested between the foreign oil companies and the government of President Lazaro Cardenas. They are:

1. The Mexican Labor Board award, granting wage increases, estimated by W. S. Farish, president of Standard Oil Co. (New Jersey), at $11,000,000 to $14,000,000 annually, and other idyllic conditions, to oil labor in Mexico.

2. The payment of royalties on private property in Mexico, acquired prior to 1917, to the Mexican government, said by companies to be a violation of the Morrow-Calles oil pact of 1928.

Size of Industry

Approximately 41,000,000 barrels of crude oil are produced a year in Mexico, 97 per cent by foreign companies. This 97 per cent is about 60 per cent British production and 37 per cent American. American investment in Mexican oil in 1929, the last year figures were available, was said to be $205,000,000. Little change in aggregate capital has since occurred.

The average net profit of the industry was said by Farish to have been $6,483,750 during the past three years.

Dates Back to 1917

The current tussle between the oil companies and the Mexican government over relative shares of the oil income dates back to Article XXVII of the Mexican Constitution of 1917, which called for nationalization of petroleum resources. In negotiation it was narrowed down to the problem of property rights in undeveloped oil lands. These were held by foreign companies as reserves and believed to amount to between 80 and 90 per cent of the total foreign holdings.

The Mexican Supreme Court, in reviewing the private property rights of these reserves, held that the right to develop oil was not a vested interest unless exercised by a positive act toward exploitation which gave the owner only preferential status.

Following this decision, the Mexican Congress passed a law in 1925 requiring holders of even developed lands to exchange their titles for government concessions of 50 years or less duration.

In the long controversy that followed, settlement was eventually reached under an agreement between Ambassador Dwight W. Morrow and President Plutarco Elias Calles in 1928.

Morrow-Calles Pact

Under this diplomatic agreement, termed the Morrow-Calles pact, the companies conceded they had only limited rights to oil properties acquired or developed after 1917, the date of the Mexican constitution. The Mexican government, on the other hand, granted full property rights, as generally understood in the U. S., to owners of oil lands who had taken positive steps prior to 1917 signifying intention of developing subsoil rights.

This latter concession of the Calles government the oil companies feel is now being violated by the President Cardenas administration.

President Cardenas announced Jan. 1 that U. S. petroleum companies can only hold their concessions if they agree to pay royalties. At present all companies pay royalties on production from federal land, but a demand for royalties on private lands is said by the companies to be a direct violation of the Morrow-Calles pact.

The extent of the royalties was not specified by President Cardenas, but his government asked—and obtained — royalties ranging up to 35 per cent from Royal Dutch Shell interests (Mexican Eagle Co.) in the rich Poza Rica field, it is said.

Shell Concession

This concession from Shell was obtained under an agreement of Nov. 11 providing for pool or unit development of the Poza Rica field. Oil companies here asserted that the concession by Shell was not in reality a royalty, but a payment in return for advantages from the government.

Shell is the only foreign company in the Poza Rica field. Under the agreement for a unit plan of operation, the Mexican government waived its right to drill as many wells on federal land as it wished and granted Shell clear title to certain lands under litigation. Shell, on the other hand, agreed to pay 35 per cent of the oil to the Mexican governments, according to the companies.

Certain observers said this granting of concessions to Shell in return for a 35 per cent royalty was a plan to divide the foreign oil concerns, but the companies stated today that no such division had taken place. They pointed out that Royal Dutch Shell and other British companies were signatories with American companies to a petition placed before the Mexican Supreme Court Dec. 29 for a permanent injunction against the Mexican Labor Board's award.

Decision

Should the Mexican Labor Board's award be upheld by the Supreme Court — considered quite possible by oil company officials — the refining plants would be shut down by the companies, in all probability, Standard of New Jersey officials said. In such an event the Mexican government may attempt to operate the plants under a receivership it is understood. While the government could doubtless rely on Mexican labor under such a plan, lack of technicians would bring failure, New York officials asserted.

Chief weapon in the hands of the Mexican government in the struggle is the natural desire of companies to operate the properties and realize a return on a $200,000,000 investment.

Chief weapon of the companies is the need of the Mexican government for tax revenues, largely derived from royalties on federal lands exploited by foreign companies. Companies stated that the Mexican government applied for a $5,000,000 loan to be guaranteed by future royalties, but was unsuccessful. The present royalty, as fixed by law ranges from five to 15 per cent of production, usually payable in cash.

This royalty is payable only on federal lands, however, and the pressure to impose a royalty payable to the government on private lands precipitated the latest clash. Wages have been in dispute since last spring.

Barnsdall Buys Crude Reserves

By Teletype
N. P. N. News Bureau

TULSA, Jan. 11.—In the largest deal of recent months, Barnsdall Oil Co. has purchased through exchange of stock the holdings of the Greta Oil Corp., founded by O. R. Seagraves. The deal is on the basis of approximately $2,250,000.

Properties include about 1000 proved acres in the Greta-Tom O'Connor and Saxet fields, of the Corpus Christi district. There are 30 producing wells and that many more locations to drill. Current allowable production is 1500 barrels daily, of which 800 is in the Greta-Tom O'Connor district, Refugio county, and the rest in the Saxet field, Nueces county, just outside Corpus Christi. There is also some wildcat acreage in the coastal area of Texas and Louisiana.

The purchase provides additional crude reserve for the new refinery of Barnsdall Refining Co., soon to be put into full operation. The Greta-O'Connor fields are on the route of the Barnsdall line from Placedo field to Corpus Christi and the Saxet field is but a few miles from the new plant.

W.P.R.A. Selects Hot Springs, Ark.

N. P. N. News Bureau

TULSA, Jan. 10. — The Western Petroleum Refiners Assn. will return to Hot Springs, Ark. again for its 26th annual convention April 25-26, Secretary A. V. Bourque has announced.

The program this year will be divided again into two parts —a technical program for plant operators, and a general program dealing with economic and legal problems.

Technical sessions will be held the afternoon of April 25 and the morning of April 26, with the program arranged by Emby Kaye, vice president of Skelly Oil Co. and chairman of the association's manufacturing committee. Some of the major problems discussed last fall at the series of regional meetings for plant operators will be discussed more fully at the Hot Springs meeting.

Vapor Lock Tests

The Pawhuska vapor lock road tests conducted last summer under the joint auspices of the W. P. R. A. and the Natural Gasoline Association of America also will have a place on the technical program.

The success of the association's silver anniversary birthday party at Hot Springs last April has resulted in the scheduling of a dinner dance the evening of April 26 to celebrate the twenty-sixth anniversary of the association.

New Refinery Manager

N. P. N. News Bureau

LOS ANGELES, Jan. 10.— From pipe fitter's helper to refinery manager in 15 years is the story behind the appointment last week of Allan H. Calderwood to manager of Shell Oil Co.'s Martinez refinery. The appointment, effective January 6th, was announced by G. H. van Senden, vice president in charge of manufacturing.

Mr. Calderwood started with Shell in Los Angeles in 1923. His first positions were assistant draftsman and pipe fitter's helper—not very high in the scale of operations. After intensive experience in all phases of petroleum manufacturing, he was made assistant manager of Dominguez refinery and then assistant manager at Martinez, the position from which he has just been promoted to be manager.

The new Martinez head succeeds E. D. Cumming, who goes east to join Shell Petroleum Corp. in St. Louis. Mr. Cumming is another Shell executive who started "at the bottom" as fireman in the company's Wilmington refinery.

S. O. Indiana Raises Kerosine Prices

CHICAGO, Jan. 10.—Effective Jan. 12 Standard Oil Co. of Indiana will restore normal markets on Perfection kerosine, Standard tractor fuel, and Stanolex furnace oil through Illinois, Indiana, Iowa, Minnesota, Missouri, North Dakota, South Dakota and Wisconsin. Chicago is unchanged.

Last previous general change was Dec. 6 when subnormal prices were advanced 0.5c.

New Pipeline Planned

By Telegraph

HOUSTON, Jan. 11.—The New Mexico Pipe Line Co.. is reported to be planning to lay 175 miles of eight-inch line from Crane county, West Texas, to fields in Gaines, Yoakum and Hockley counties, relatively new areas of activity.

The company is jointly owned by The Texas Co., Sinclair Prairie Oil Co., Tide Water Oil Co., and Cities Service Oil Co., with Texas owning a half interest and in charge of operations.

Gasoline Stocks in U. S. Increase Despite Reduced Crude Runs

NEW YORK, Jan. 11. — Gasoline stocks in the U. S. continued to mount the first week in January despite a sharp drop in refinery crude runs, the report of the American Petroleum Institute today shows.

Estimated total motor fuel inventories rose 1,902,000 barrels while daily average crude runs at plants with 89.0 per cent of the country's refining capacity were curtailed 93,000 barrels. Gas and fuel oil stocks increased 486,000 barrels.

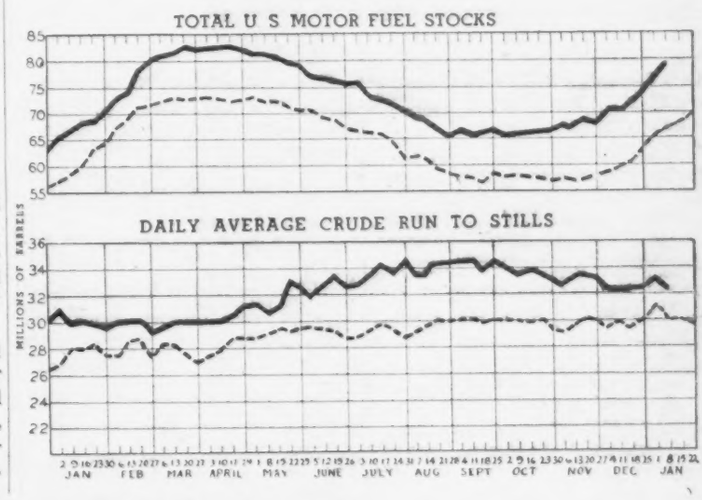
While the increase in motor fuel stocks the past week was less than in the last week of 1937, the rate of increase was considerably greater than in the early weeks of 1937. Standing at 79,331,000 barrels as of Jan. 8, estimated total stocks were 14,104,000 barrels above inventories on Jan. 8, 1937, and within 4,207,000 barrels of the 1937 peak reached in the week ended March 27.

Oklahoma - Kansas - Missouri and North Louisiana-Arkansas refiners made substantial withdrawals from inventories of gasoline the past week, but increased stocks were reported for all other districts. Among the larger increases were: East Coast, 591,000 barrels; Indiana-Illinois-Kentucky, 423,000 barrels; Texas-Gulf, 364,000 barrels; and Louisiana-Gulf, 335,000 barrels.

A 52,000-barrel reduction in daily average runs at East Coast refineries accounted for more than half of the total cut in crude runs.

DAILY AVERAGE PRODUCTION IMPORTANT DISTRICTS
American Petroleum Inst. Figures

	Week Ended Jan. 8	Jan. 1
	Barrels	Barrels
Oklahoma City	121,000	109,550
Total Okla....	538,800	533,700
East Texas...	492,150	491,200
Total Texas...	1,375,300	1,378,900
Rodessa	42,500	43,150
Total La.....	247,250	251,050
California	709,500	701,700
E. of Rockies.	2,727,600	2,734,900
Total U. S.....	3,437,100	3,436,600
Crude imports.	55,710	100,280
Tot. new sup'ly	3,492,810	3,536,880



CURRENT REFINERY OPERATIONS

Districts	Per Cent Capacity Reporting	Daily Average Crude to Stills (Barrels) Week Ended		Per Cent of Reporting Capacity Operated Week Ended		Stocks Thousands of Barrels Total Finished and Unfinished Motor Fuel*		Total Finished and Unfinished Motor Fuel*		Gas & Fuel Oil		Cracked Gasoline Production % Total Capacity Reporting	Daily Av. Production (Barrels) Week Ended	
		Jan. 8	Jan. 1	Jan. 8	Jan. 1	Jan. 8	Jan. 1	Jan. 8	Jan. 1	Jan. 8	Jan. 1		Jan. 8	Jan. 1
East Coast	100.0	525,000	577,000	78.5	86.2	18,819	18,228	12,284	12,339	100.0	105,000	111,000		
Appalachian	88.4	100,000	107,000	77.5	82.9	3,114	3,058	1,164	1,145	94.6	26,000	29,000		
Ind., Ill., Ky.	92.4	402,000	414,000	82.2	84.7	12,659	12,236	6,931	6,815	98.5	130,000	139,000		
Okla., Kans., Mo.	84.7	253,000	248,000	66.1	64.8	6,791	6,960	3,664	3,724	90.3	71,000	68,000		
Inland Texas	56.6	136,000	125,000	67.7	62.2	2,548	2,434	1,720	1,793	71.7	37,000	40,000		
Texas Gulf	95.7	735,000	742,000	92.2	93.1	11,521	11,157	11,299	10,925	98.0	176,000	168,000		
La. Gulf	96.6	124,000	145,000	73.8	86.3	2,699	2,364	3,454	3,439	100.0	26,000	30,000		
No. La., Ark.	63.7	34,000	48,000	58.6	82.8	397	427	474	499	77.5	7,000	8,000		
Rocky Mt.	69.7	41,000	29,000	66.1	46.8	1,755	1,691	662	617	85.4	13,000	11,000		
California	90.9	542,000	550,000	72.7	73.7	14,538	14,376	74,694	74,574	98.0	63,000	68,000		
Total Reporting	89.0	2,892,000	2,985,000	78.1	80.6	74,841	72,931	116,346	115,870	94.8	654,000	672,000		
Estimated U. S. Total (Bur. of Mines Basis)		3,210,000	3,320,000			79,331	**77,429	119,146	118,660		720,000	750,000		

*Includes stocks at refineries, in bulk terminals, pipe lines and in transit.
**Revised.

Truck Rate Hike Planned If Rail Plea Is Granted

N. P. N. News Bureau

WASHINGTON, Jan. 10. — Certainty that truck transportation rates will be hiked commensurately, should the Interstate Commerce Commission grant the 15 per cent freight rate increase sought by the railroads, was expressed here following the preparation last week of a petition asking such an increase for motor carriers.

The petition, prepared by American Trucking Associations, Inc., was not filed, however. It was explained that filing of the petition would result in ICC hearings and long proceedings, similar to those in the railroad case, whereas the truckers have already made their position of wanting more revenue known by intervening and presenting testimony in the railroad case.

It was further pointed out that no maximum rate orders are outstanding for motor carriers, as there are for rails, and all that it will be necessary for the trucks (common carrier) to do will be to file new tariffs containing the higher rates and establishing an effective date shortly after filing date.

While this procedure probably will result in complaints on some specific rates, which will lead to suspension of these rates pending an ICC investigation, it is felt that less delay in getting the bulk of the increased revenue which the truckers say they so sorely need will be caused by this method than by filing a petition for the general increase.

Mrs. Brammer Dies

By Teletype
N. P. N. News Bureau

TULSA, Jan. 11.—Mrs. L. R. Brammer, wife of the sales manager for Danciger Oil & Refineries, Inc., was fatally injured in an auto collision near Dallas the evening of Jan. 10. Mr. Brammer, who was driving one of the cars which collided at a highway intersection, and Mrs. Bradley Murray of Tulsa, daughter-in-law of Mrs. A. Danciger, escaped serious injury. The three were enroute to Tulsa at the time of the accident.

Coming Meetings

Gov. Marland's Petroleum Conservation Conference of Oil State Governors, Hot Springs, Ark., tentative date, Jan. 17.

American Road Builders' Assn., Cleveland, Ohio, Jan. 17 to 21.

Northwest Petroleum Assn., North Dakota Division, Parker Auditorium, Minot, N. D., Jan. 24 and 25.

Northwest Petroleum Assn., Minnesota Division, Hotel Radisson, Minneapolis, Jan. 27 and 28.

Kentucky Petroleum Marketers Assn., Brown Hotel, Louisville, Ky., Feb. 7, 8 and 9.

Missouri Independent Oil Jobbers Assn., Hotel Baltimore, Kansas City, Mo., Feb. 9, 10.

Kansas Oil Men's Assn., 24th annual convention and oil exposition, Hotel Broadview, Wichita, Kans., Feb 14 and 15.

American Institute of Mining and Metallurgical Engineers, annual meeting, Engineering Societies Bldg., New York, N. Y., Feb. 14 to 17.

Illinois Petroleum Marketers Assn., Pere Marquette Hotel, Peoria, Ill., Feb. 16 and 17.

Association of Highway Officials of the North Atlantic States, Hotel Ambassador, Atlantic City, N. J., Feb. 16, 17 and 18.

American Petroleum Institute, Division of Production, Mid-Continent District, Herring Hotel, Amarillo, Tex., Feb. 17 and 18.

Ohio Petroleum Marketers Assn., fifteenth annual meeting, Hotel Deshler-Wallick, Columbus, Ohio, Feb. 22, 23 and 24.

Wisconsin Petroleum Assn., Schroeder Hotel, Milwaukee, Wis., Feb. 22, 23 and 24.

Indiana Independent Petroleum Assn., Spring Convention and Refiners and Suppliers Exhibit, Hotel Severin, Indianapolis, Ind., March 2, 3 and 4.

Iowa Independent Oil Jobbers Assn. and trade exhibit, Fort Des Moines Hotel, Des Moines, Iowa, March 2, 3 and 4.

American Society for Testing Materials, Spring Regional Meeting and Group Committee Meetings, Seneca Hotel, Rochester, N. Y., March 7 to 12.

Society of Automotive Engineers, National Aeronautic Meeting, Mayflower Hotel, Washington, D. C., March 10 and 11.

American Assn. of Petroleum Geologists, 23rd annual meeting, Roosevelt Hotel, New Orleans, La., March 16 to 18.

American Society of Mechanical Engineers, Los Angeles, Calif., March 23, 24 and 25.

American Petroleum Institute, division of production, spring meeting, southwestern district, Blackstone Hotel, Fort Worth, Texas, March 24 and 25.

Society of Automotive Engineers, National Passenger Car Meeting, Hotel Statler, Detroit, Mich., March 28, 29 and 30.

National Petroleum Assn., Cleveland, Ohio, April 13 to 15.

Petroleum Industry Electrical Assn., Rice Hotel, Houston, Texas, April 13, 14 and 15.

American Chemical Society, Dallas, Texas, April 17 to 21.

American Institute of Mining and Metallurgical Engineers, Open Hearth Conference, Buffalo, N. Y., April 20, 21 and 22.

Western Petroleum Refiners Assn., 26th annual meeting, Hotel Arlington, Hot Springs, Ark., April 25, 26 and 27.

Natural Gasoline Assn. of America, 17th annual convention, Hotel Tulsa, Tulsa, May 11 to 13.

International Petroleum Exposition, Tulsa, Okla., May 14 and 21.

American Petroleum Institute, mid-year meeting, Wichita, Kan., May 23, 24 and 25.

Natural Gasoline Assn., of America, Hotel Tulsa, Tulsa, Okla., some time in May.

Society of Automotive Engineers, summer meeting, The Greenbrier, White Sulphur Springs, W. Va., June 12 to 17.

Pennsylvania Grade Crude Oil Assn., William Penn Hotel, Pittsburgh, Pa., June 16, 17 and 18.

American Society of Mechanical Engineers, St. Louis, Mo., June 20 to 24.

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Fuel Engineers Analyze Knock Testing Variables

By ARCH L. FOSTER, Technical Editor

● One of the serious, but not insurmountable, problems in the work of rating motor fuels for anti-knock properties has been the need for more uniform correlation between the showing of fuels in the laboratory engine and the performance of the same fuels in commercial engines in road tests. Recent findings in co-operative test work, and from exhaustive research in at least one of our foremost laboratories, show very clearly the trend of investigation and the conclusions which have been reached.

"It can be concluded, therefore, that there is need for a laboratory test method which will give a more satisfactory evaluation of the relative knocking characteristics of all types of fuels than the present motor (ASTM) method."

So concludes T. A. Boyd in summarizing the results of the 1937 Road Knock Tests carried out by the Co-operative Fuel Research Committee, before the Society of Automotive Engineers. This committee finds that, when averaging all fuel ratings obtained, the ASTM motor method gives the best average correlation with road tests, as compared to the correlation of the latter with the L-3 and the Research methods. The motor method still falls short, however, of showing a satisfactory correlation, rating some fuels too high and others too low.

Summarizing the effects of carburetion and manifolding on anti-knock characteristics in multi-cylinder engines, Bartholomew and collaborators state: "Definite and consistent effects of non-uniform fuel distribution are now apparent in any fuel knock rating data obtained on a group of cars." (These quotations must not be taken too exactly without considering them in connection with the contexts of the papers where they appear.) Earlier these authors state; "Before an attempt is made to duplicate on the laboratory engine the ratings obtained on a given car, it is believed advisable to construct a chart * * * * * in which air-fuel ratio, spark advance and cylinder knock intensity are plotted against cylinder number."

These brief quotations, considered along with many other investigations over a period of years, show that technologists have reached, or are approaching, a point where they can begin to take the engines and fuels apart, and determine the effect of this variable and that on road performance. Spark settings can be determined, adjusted and changed; fuel-air ratios likewise; but uniformity of fuel distribution even with controlled air-fuel ratios is a more difficult proposition.

Bartholomew believes that the substitution of a manifold on the laboratory engine simulating the fuel distributing action of the manifold of a given car would give data explaining the "anomalous behavior of fuels" in the car. Since the performance of the car engine and the fuels on the road is the court of last resort, the laboratory test must correlate with the road test. The best method to effect this agreement is to reproduce as nearly as practicable the road engine conditions in the laboratory engine design.

The most immediately important matter, it is said, after finding the existence of the effects of imperfect fuel distribution, is to develop means for correction of road rating discrepancies, on fuels showing equal laboratory ratings, which are due to this distribution variable. The British technologists use such a correction factor for benzol blends. They add one octane number to the conventional laboratory rating for the first 30% of total aromatics in the fuel; for each additional 15% of aromatics another octane number is added to the rating.

Because of the comparatively numberless variations in the design and operating conditions of different engines on the road, it becomes possible that more than one compensating correction may be necessary, to make laboratory ratings agree with road performance. Road and laboratory results are affected by variations in fuel volatility, distillation range, chemical composition, the anti-knock ratings of parts of the fuel of different boiling ranges, comparative cylinder temperatures, etc. All these must be correlated in some way for satisfactory test agreement.

Refining Technology

●

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Rapid Method for Low Temperature Fractionation of Gases, Vapors and Liquids...by F. N. Laird R-3

A simplified, portable, light-fraction analytical apparatus for field use, for the rapid and accurate analysis of natural gas and gasolines, in which glass is replaced in most items by metal.

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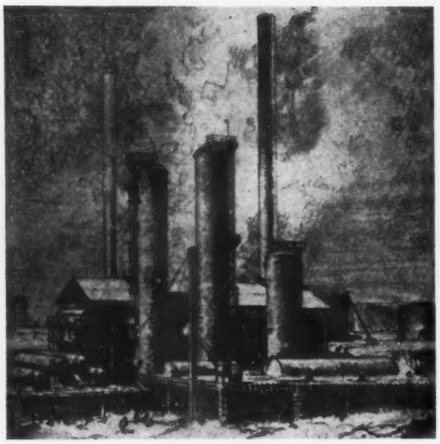

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EDITORIAL
APPEARED
OCTOBER 28th
1937

the OIL AND GAS JOURNAL

PRODUCING REFINING NATURAL GASOLINE PIPE LINE

Published weekly by The Petroleum Publishing Company at Tulsa, Oklahoma

Speaking of Size

The industry, centering its gaze upon the large increase in production of its raw material, its near record in drilling wells and the marvelous technological progress in the finding and recovery of crude oil, may overlook the fact that this oil must be converted into finished products before it enters consumption and that these achievements have been paralleled in the manufacturing division.

The petroleum refiners of the United States have so far this year refined into finished products over 300,000 barrels of crude daily more than in any previous period in the history of the industry.

Something of what is going on in the refining di- ... all the refining industry ... en-

A 36,000-barrel daily installation of this type is capable of supplying the entire gasoline requirements of the state of Oklahoma, or the aggregate requirements of Arizona, Delaware, Nevada, Vermont, Wyoming and New Hampshire.

Taking advantage of large scale operation, the industry has been able to improve all phases of manufacturing and to reduce costs per barrel despite steady improvements in quality. This explains why the price of gasoline remains low in contrast to the ascending prices of other commodities.

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RAPID METHOD

For Low Temperature Fractionation Of Gases, Vapors and Liquids

By F. N. LAIRD*

Presented Before California Natural Gasoline Association, Oct. 7, 1937.

Abstract

The author describes an apparatus made chiefly of metal instead of glass as in the standard low temperature apparatus, and a method by which accurate analyses may be made in the field and elsewhere which are within an accuracy limit of 1% as compared to results from standard equipment and method. The time for an analysis is reduced to 50% to 20% of the time required by the standard apparatus for the same work.

Solid carbon dioxide replaces liquid air as the refrigerant in this method. The apparatus is estimated to cost not more than $100 to $200 overall.

THE direct analysis of natural gas and gasoline by low temperature fractional analysis, using liquid air, has been practiced for over ten years. The direct results obtainable have been of value to research and development and general plant engineering. On the other hand, low temperature analysis has always possessed the limiting factors of length of time required to complete a test; fragility; lack of portability; high initial cost; and high cost of operation. It has therefore been necessary to confine the apparatus to fixed locations, such as a field laboratory, and bring the samples to it. In bringing samples to the instrument another problem is frequently encountered in the form of difficulties in obtaining and transferring representative samples. These difficulties can be overcome, but involve a complicated and costly technique.

It is apparent then that the utility of the complicated low temperature analysis procedure has been largely limited to the analysis of occasional samples, or the analysis of samples for research, development or survey work. In spite of its usefulness the method has never been applied to the broad field of general plant and field testing now covered by the charcoal test.

Three years ago the idea occurred to the writer that if low temperature analysis could be conducted in glass, then why not in metal? If the method could be made to work in metal, they why could it not be simplified through the elimination of many working parts necessary to the glass form? And further, could some other cooling agent be used which would replace the costly liquid air? If such an apparatus could be devised, could it be made to operate with an accuracy equal to the standard low temperature analysis procedure, and could it be small, lightweight and constructed with a ruggedness which would give portability?

Fig. 6. Modified composition analysis apparatus

A search revealed the possibility of designing an apparatus which would partially condense a gas sample, fractionate the portion lighter than isobutane as a lump, and retain all of the isobutane and heavier fractions. The possibility of determining propane seemed very promising also.

W. J. Murray (1) has developed a formula for calculating the amount of any hydrocarbon which will condense under any pressure and temperature. It is:

$$C_1 = \frac{LC}{100\frac{Pc}{P} + L\left(I - \frac{Pc}{P}\right)}$$

Where:

C_1 = mols of component in liquid after condensation.

C = mols of component in gas.

P_c = Absolute vapor pressure of pure component at temperature of condensation.

*The Texas Co.

(1) "Compression of refinery and casinghead gases," Ind. Eng. Chem., Oct., 1929.

P = total pressure on system.
L = total mols of liquid after condensation.

With this formula a series of calculations were made to find how much of each component will condense at —110°F. (sublimation temperature of carbon dioxide), and pressures from 0 to 32 pounds absolute. These calculations were carried out for propane, isobutane, butane, isopentane and pentane. Fig. 2 shows these data plotted when 20 mol per cent of the gas condenses at —110°F.

From Fig. 2 we can see that all of the isobutane and heavier is not condensed. But the curve shows clearly just how much is condensed. If the condensation took place at atmospheric pressure, Fig. 2 tells us that 66.5% of the propane will condense; 91.5% of the isobutane; 97.5% of the n-butane; 99.2% of the isopentane; and 99.5% of the n-pentane. All that is necessary then to obtain accurate results for the fractionation data obtained is to correct the amounts of each component found from the curves in Figs. 3, 4, and 5.

The unit designed to accomplish the condensation and fractionation of the gas is primarily a reproduction of standard fractionation apparatus in metal (Fig. 1). All glass parts are eliminated except the kettle and butane condensation bulb. The final apparatus consists essentially of a gas dehydrating unit, graduated condensing and distilling kettle, fractionating column, condenser section, pressure gauge, rate control valve, and rate manometer, butane condensation bulb, displacement meter capable of measuring under vacuum, and a vacuum pump. All of these items are assembled of materials lending ready portability to the completed unit. The dimensions of the various parts, in relation to one another, are very important if accurate results are to be obtained.

The following dimensions are the most suitable for the column when using an original condensed sample of between 1 and 8 ml, for field testing and plant testing work. The fractionating section consists of an aluminum tube ⅜-inch O.D by 3/16-inch I.D. and 26½ inches long. The condensing section is 7/16-inch O.D. by 11/32-inch I.D. and 5¼ inches long. The connection between the two tubes is a machined aluminum reducer which does not allow any liquid to be held up in the condenser section. The thermometer used to read the distillation temperature is of the ordinary cloud and pour point type, reading —70 to plus 70°F. The bulb is placed ½-inch above the junction of the ⅜-inch and 7/16-inch tubing.

The fractionating section is housed in the center of 2 inches diameter light weight aluminum tubing and is insulated with fairly tightly packed kapok in the intervening space. The condenser is made of 2-inch diameter aluminum tubing inside 6-inch diameter aluminum tubing and is insulated with kapok. The condenser section carries a drain cock which facilitates changing the bath liquid.

A shorter column will give relatively poorer fractionation, while a longer one will proportionately lengthen the distillation time. The same is true for the condenser section. The use of aluminum tubing for the fractionating

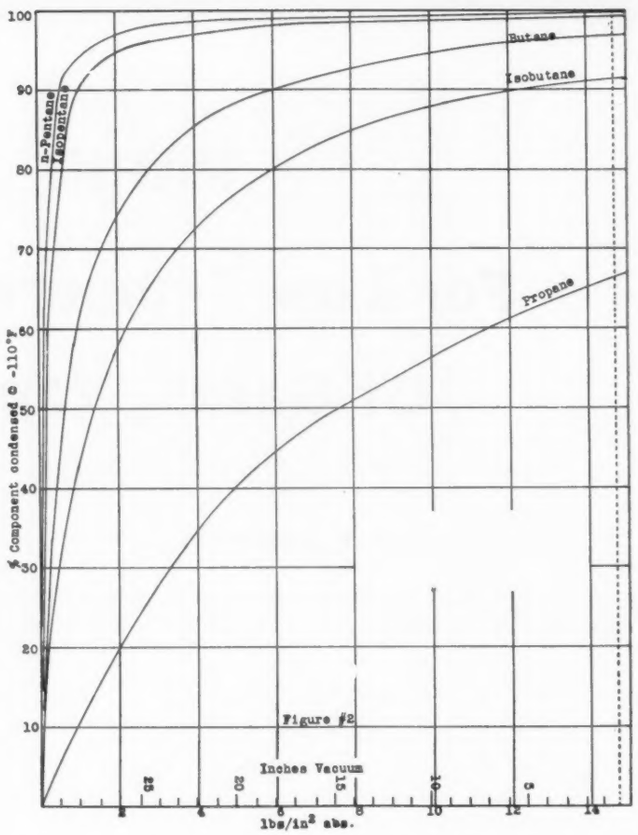
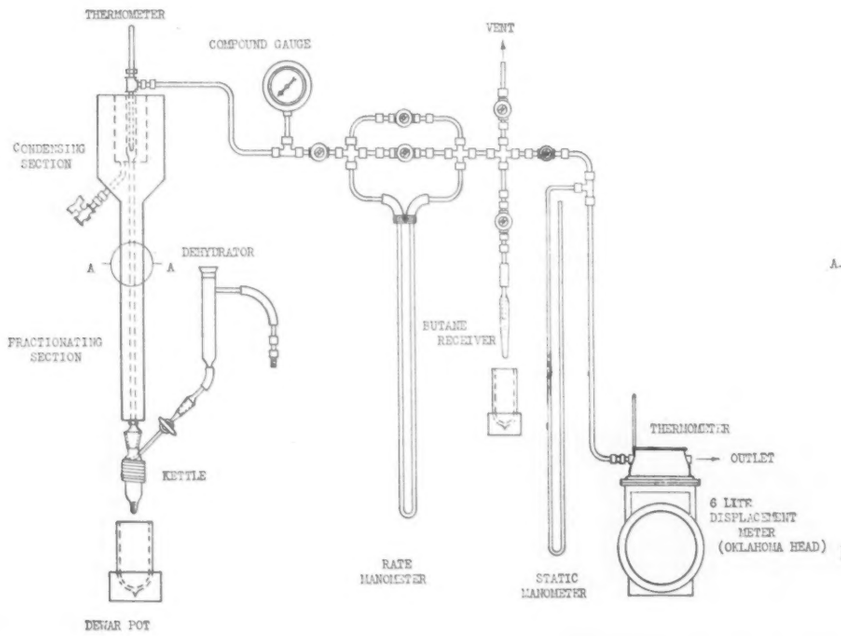


Fig. 2. Curves drawn from Murray's formula for the compression and condensation of gas, assuming 20 mol% of gases to condense. This corresponds to a 3GPM wet gas



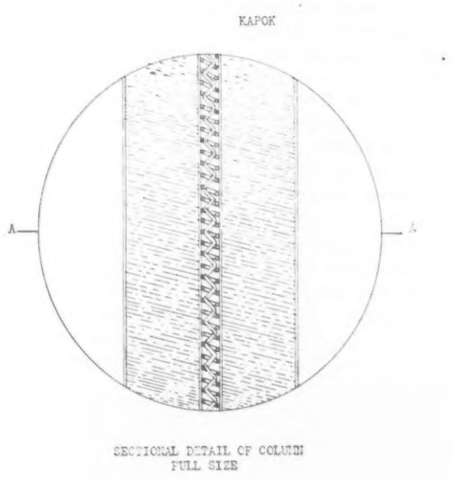


Fig. 1. Details of Laird apparatus for rapid analysis of light fractions

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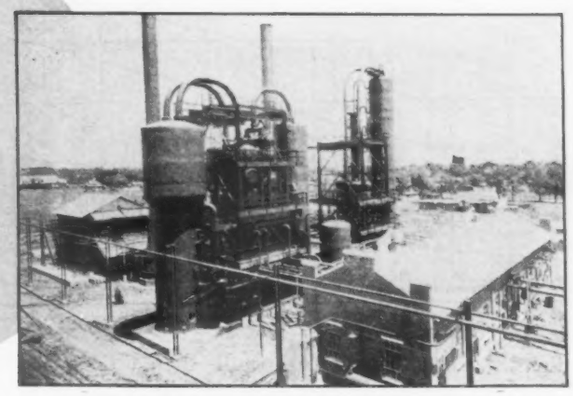

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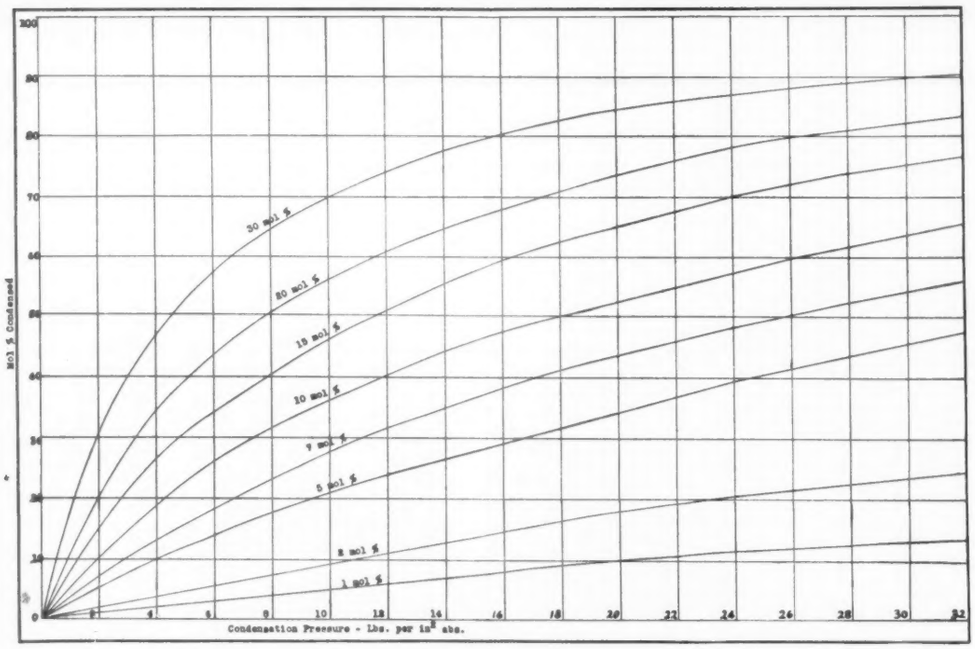

Fig. 3. Mol per cent of propane condensed at varying pressures, and the total mol per cent condensed

and condensing sections gives much better results than glass tubing because the heat transfer is faster and smoother. The breaks are therefore more distinct and uniform. By placing the thermometer as indicated above, the dead space in the condenser is reduced to a minimum and the accuracy of the analysis thereby increased. To further reduce the dead space, ⅛-inch O.D. copper tubing is used to connect the column to the rate control valve and pressure gauge.

The fractionating column is packed with a double spiral of No. 22 ga. nichrome wire. The outside spiral is 8 turns to the inch and fits snugly against the ⅜-inch aluminum tubing, while the inside spiral is wound in an opposite direction 4 turns to the inch and fits loosely inside the outer spiral.

The kettle used varies in size with different samples; it is graduated in 0.1 ml. up to 15 ml. The gas enters the kettle through a coil of 5 mm. O.D. pyrex tubing wound about the main body of the kettle and entering it at about the 7 ml. graduation. The coil has not less than 7 turns of 2 inches diameter.

All valves used are ⅛-inch needle valves and eliminate the use of glass stopcocks quite satisfactorily. The rate control manometer has two orifices and a valve so arranged that they may operate separately or together. This permits a large differential for slow distillation rates and also for rapid sample introduction rates at low differential by merely switching orifices.

The butanes receiver is an ordinary 15-ml. centrifuge tube fitted up in a manner similar to a conventional condensation bulb.

The operation of the unit is quite similar to that of the standard glass column. Of course the column itself is not visible and so the glass column operator has some trouble (purely psychological) but after several runs gets along quite nicely. The average field tester unused to handling the standard glass column, frequently acquires skill faster in manipulating the modified metal column than experienced laboratory men who have worked with only glass columns.

The following results were obtained by field testers after witnessing one run by an experienced operator, and illustrate the reproducibility of results to be expected. Note

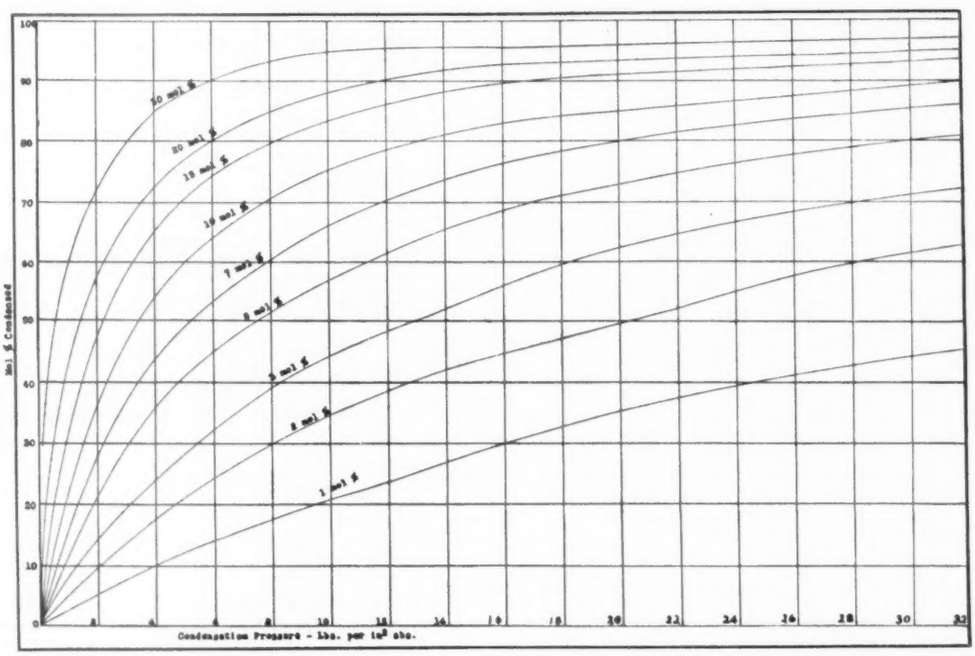

Fig. 4. Mol per cent of isobutane condensed at varying pressures, and the total mol per cent condensed

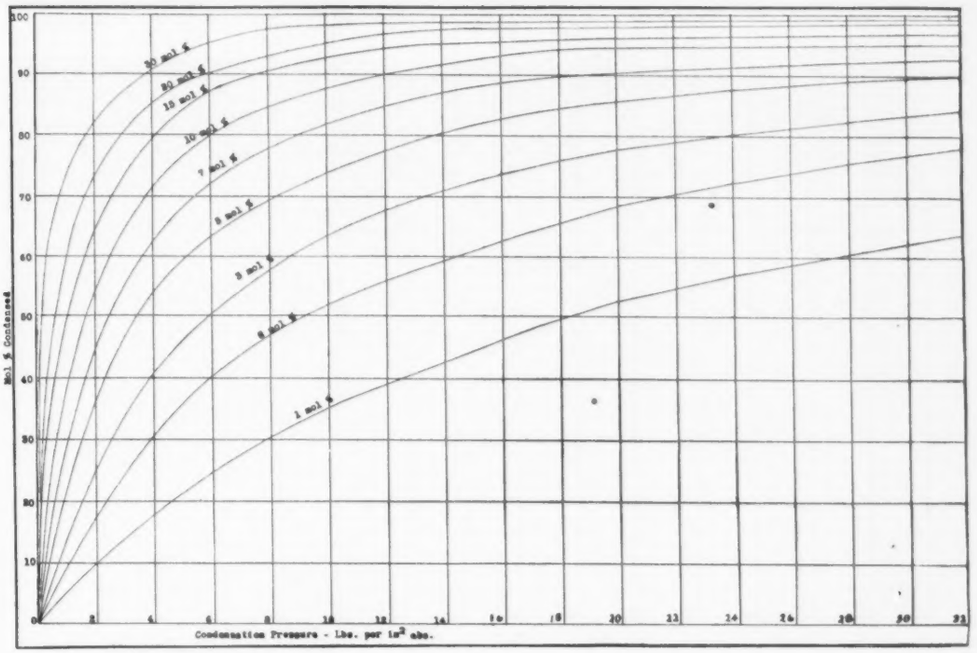

Fig. 5. Mol per cent of n-butane condensed at varying pressures, and the total mol per cent condensed

how operator A (the experienced operator) checked himself:

TABLE NO 1.

Analyses of Identical Samples by Different Operators

Operator	A	B	C	D	A
ic_4 plus	4.366	4.257	4.116	4.261	4.310
nc_4 plus	3.650	3.533	3.463	3.511	3.593
ic_4 plus	1.911	1.962	2.092	1.947	1.945

How do the results obtained by modified composition analysis compare with those obtained by standard low temperature fractionation? After the unit was completed along the lines described above, an exhaustive series of analyses were made on samples taken simultaneously, first with the modified composition analysis unit and then by standard low temperature fractionation according to C.N.G.A. Bulletin TS-321.

When this comparison was first begun the modified composition analyses were consistently higher in isopentane-plus than the standard analyses. In order to check this difference all samples were taken directly in a C.N.G.A. gas kettle at the sample source, transported to the laboratory in liquid air and analyzed by the conventional C.N.G.A. method using the method described by Robinson and Laird (2) for determining the isopentane-plus fraction. After these precautions were taken the results checked well.

The curve in Fig. 8 shows how closely the modified composition analysis column results check those obtained by the standard C.N.G.A. apparatus. This curve also shows that modified composition analysis will work on all gases found in the Los Angeles Basin, from the leanest to the richest, no matter what the composition. There is also every reason to expect that the duplicability will hold for other districts as well.

At this point it is interesting to note the application of the apparatus to a gas which can give confusing results by the charcoal test. The composition follows:

Air	0.11
Carbon dioxide	0.30
Methane	89.40
Ethane	1.06
Propane	1.67
Butanes	2.40
Isopentane+	5.06

From the analysis it is seen that the methane percentage is high, ethane very low, propane almost twice as high as ethane, butanes higher than propane and isopentane-plus much higher than butanes. According to a theory of temperature rises in a charcoal tube, this would be a hard gas to run, because the propane would saturate the tube ahead of the ethane, the butanes ahead of propane, and the fourth rise would mean nothing since butane would be lost before the fourth rise. In actual practice with this type of gas, it is hard to tell where the fourth rise actually occurs, because it seems to come almost on top of the third. Modified composition analysis runs higher than the 30-pound-32° charcoal test on this gas which would indicate that some butanes are lost in saturating the tube to an estimated fourth rise. The field tester has no way of knowing this. With modified composition analysis it makes no difference what the composition of the gas might be, since no set amount of gas is used.

For plant work the unit works well on all gases, vapors and liquids. One unit can survey a complete plant in from 8 to 24 hours. The results are comparable to composition analysis and obtained much quicker and cheaper. Comparative results on plant samples are as follows:

	Rectifier Vent Vapors	
	MCA	CA
Isobutane plus	8.442 GPM	8.323 GPM
N-butane plus	2.477 GPM	2.281 GPM
Isopentane plus	Trace	0.037 GPM

This type of sample is most difficult to analyze and takes from 20 to 36 hours on a C.N.G.A. standard column. With the modified column it required but three hours and three to four pounds of dry ice.

	Finished Product	
	MCA	CA
Isobutane	2.39%	2.24%
N-butane	24.08%	25.25%
Isopentane+	73.53%	72.51%

This sample takes about 2½ hours by MCA and 6 hours by CA.

	Dry Gas	
	MCA	CA
Isobutane plus	0.236 GPM	0.248 GPM
Butane plus	0.098 GPM	0.091 GPM
Isopentane plus	0.019 GPM	0.016 GPM

This sample takes about 3½ hours by MCA and 24 hours by CA.

The problem of taking, transporting and transferring samples is solved by taking the sample directly into the apparatus. The only contact made by the sample between the sample source and the column is its passage through a drier between the line and the apparatus. Flexible metal tubing is used for a sample introduction line, in order to get away from the absorption of hydrocarbon by the rubber in

(2) C. N. G. A. proceedings, Oct. 1935.

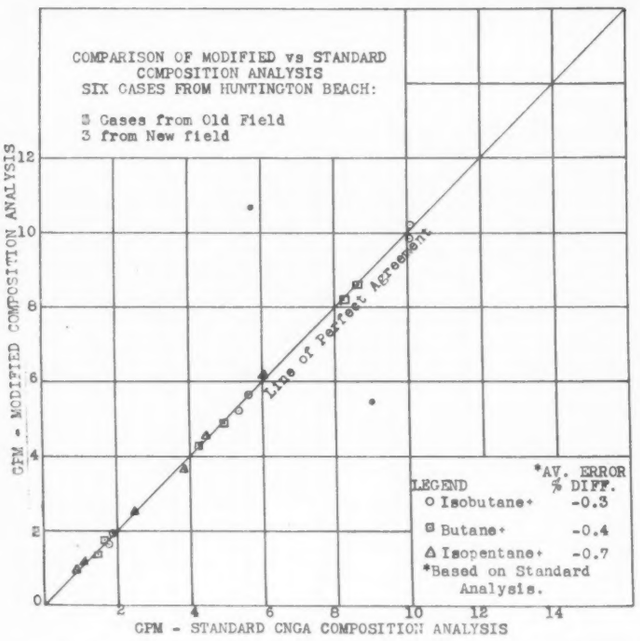

Fig. 8. Comparison analyses on several California gases to show closeness of agreement between modified and standard methods. Similar curves dealing with gas from other fields show practically identical comparison

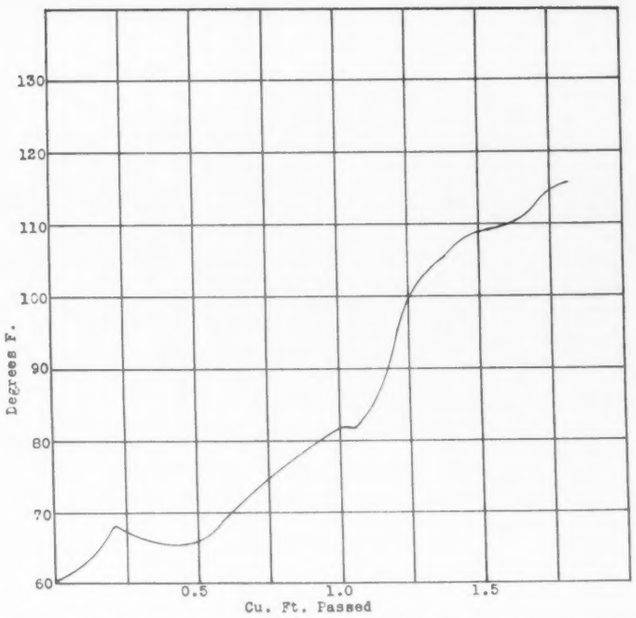

Fig. 9. Variations in temperature cause difficulties in tube saturation and gas analysis; some variations are shown in this curve. The modified analysis method eliminates this problem, since no set amount of gas is used in analysis

ordinary tubing. Where flexible connections are necessary in the apparatus itself Duprene tubing is used.

What does it cost to build a modified composition analysis apparatus; how does the time required for an analysis with it compare with standard low temperature analysis; and what is the cost per analysis, in comparison to standard low temperature analysis?

A complete modified composition analysis unit can be assembled for between $100 and $200. The price depending on how fancy and complete the unit is to be built. This price is a rough estimate based on our construction of one unit for our use.

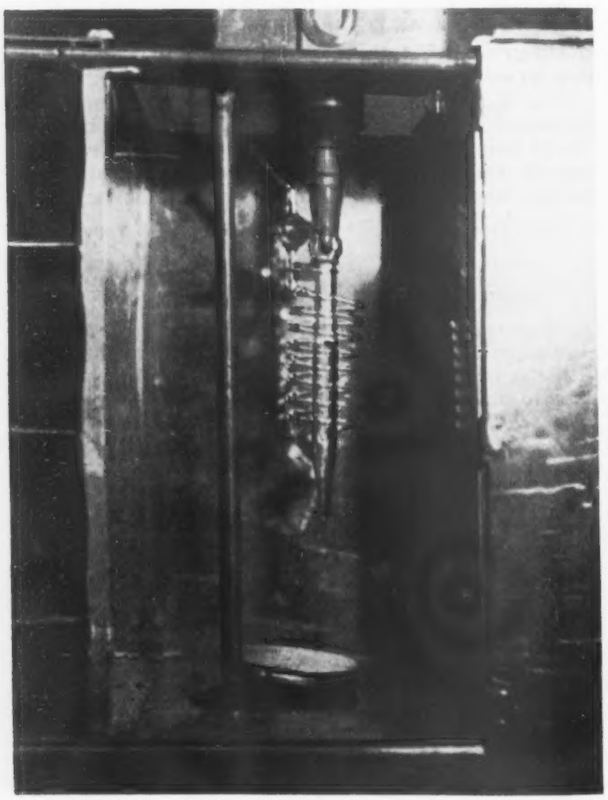

Fig. 7. The condensation and fractionating kettle of the composition analysis apparatus, which shows also the tip of the fractionating column

An analysis of the time required to complete an analysis with modified composition analysis as compared with standard composition analysis shows an average of 1½ to 3 hours for MCA against 6 to 24 hours for CA.

The average modified composition analysis costs about 5 to 10 cents for materials against $3.50 for standard composition analysis.

In conclusion it is well to emphasize that this apparatus is not presented as a cure-all for plant and field use. It has its limitations. But it is believed that careful investigation will reveal it to be an instrument which is cheap to build; possesses a ruggedness and portability wholly satisfactory for rough field use; gives results in a much short- agree to within 1% with those obtainable by standard low er time, and more economically, than the present standard low temperature fractionation method; gives results which temperature fractionation; and finally introduces a complete instrument for the direct analysis of gases, vapors and liquids which can be readily handled by men unskilled in complicated laboratory procedures.

The writer wished to acknowledge the work of C. F. Braun Co. in the construction of the apparatus, and the suggestions and encouragement given by the faculty of the University of Southern California.

Gainesville Refining Changes Name

GAINESVILLE, Tex., Jan. 6.—On Jan. 1 the name of the Gainesville Refining Corp. was changed to Denver Producing & Refining Co. Management, officers and employes remain the same, but the change in name is to bring this company as well as other subsidiary and associated companies, under one name, according to C. W. Anderson, sales manager.

The Gainesville company operates a 2,500 barrel skimming plant at Gainesville, North-Central Texas.

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Patent Literature OF TODAY

Dewaxing. No. 2 100 099, *issued Nov.* 23, 1937; *filed March* 10, 1932; *C. C. Buchler and J. M. Page, Jr., assignors to Standard Oil Co. (Ind.); one drawing;* 15 *claims.*

Wax-bearing lubricating oil is dewaxed by admixing the oil with dichlorethyl ether, cooling the mixture for separation of wax, and separation of dichlorethyl ether from the dewaxed oil.

* * *

Motor fuel. No. 2 100 287, *issued Nov.* 23, 1937; *filed June* 29, 1936; *V. Conquest, assignor to Armour & Co.; no drawing;* 4 *claims.*

* * *

A small amount of an aralkyl ketone, the aryl radical of which is chosen from the group consisting of unsubstituted phenyl, tolyl and xylyl, and the alkyl group is a straight-chain unsubstituted alkyl radical containing at least eight carbon atoms, is added to motor fuel. Object is to inhibit gum formation and prevent the deposition of carbon in engine cylinders.

* * *

Combination unit. No. 2 100 283, *issued Nov.* 23, 1937; *filed June* 16, 1933; *P. C. Keith, Jr., assignor to Gasoline Products Co.;* 3 *drawings;* 11 *claims.*

Heavy oil is passed to a stripping zone where vapors are separated from liquid residue and the residue passed through a first cracking zone. Cracked products pass to an evaporating zone where vapors are separated from liquid residue. Vapors from the stripping zone are fractionated to form a condensate which is passed through a second cracking zone. Resulting cracked products pass to an evaporating zone to be admixed with products from the first cracking zone.

Liquid residue is removed from the evaporating zone, pressure being removed to cause partial vaporization, and the resulting vapors passed upwardly through the above mentioned stripping zone to aid in heating and distilling the heavy oil while preventing the mixture of the stock passing through either of the above mentioned cracking zones with undistilled portions of this residue. Vapors separated in the evaporating zone are fractionated to form a final desired light product.

* * *

Dewaxing. No. 2 100 662, *issued Nov.* 30, 1937; *filed Mar.* 12, 1935; *A. L. Lyman and M. M. Holm, assignors to Standard Oil Co. (Cal.); one chart;* 2 *claims.*

Wax is separated from oil by continuous filtration at a rapid rate with a high yield of dewaxed oil and production of a wax filter cake having low oil content. The oil, a wax crystal conditioner, and a hydrocarbon solvent are dissolved together into a liquid at normal temperature and pressure and with A.S.T.M. 50% point below 250° F. The solution is chilled until wax solidifies by directing the solution through cooling means in non-turbulent flow and in such manner as to prevent shock chilling and temperature mixing of any minor portions of the solution to insure obtaining a high filter rate during prolonged continuous filtration.

* * *

Lubricating oil. No. 2 100 685, *issued Nov.* 30, 1937; *Apr.* 27, 1936; *G. S. Cavanaugh; no drawing;* 5 *claims.*

From .05 to 10% of diethylene oxide is added to lubricating oil to prevent formation of sludge in internal combustion engines.

* * *

Solvent extraction. No. 2 101 497, *issued Dec.* 7, 1937; *filed Aug.* 10, 1935; *J. H. Grahame, assignor to The Texas Co.; no drawing;* 4 *claims.*

High viscosity index and low viscosity index oils are separated by extraction with furfural in the presence of beta trichlorethane. An extract phase is formed containing in low viscosity index constituents dissolved in solvent liquid and a raffinate phase comprising relatively high viscosity index constituents.

* * *

Lubrication oil. No. 2 101 632; *issued Dec.* 7, 1937; *filed Nov.* 12, 1935; *W. W. Weinrich, assignor to Gulf Research & Development Co.; no drawing;* 4 *claims.*

Tributyl phosphite, usually under 1%, is used in lubricating oil to prevent decomposition in storage and use and to stabilize the oil against oxidation in the presence or absence of metals, particularly bearing surfaces of alloys containing cadmium and copper.

* * *

Solvent extraction. No. 2 101 643, *issued Dec.* 7, 1937; *filed July* 30, 1930; *E. F. Engelke, assignor to Power Patents Co.; no drawing;* 11 *claims.*

Residuum is mixed with an equal volume of a mixture comprising about two parts of a secondary amyl alcohol and about five parts of secondary butyl alcohol to which is added enough isopropyl alcohol to precipitate the desired fraction of oil. The first precipitate is mixed with about an equal volume of a mixture of secondary amyl alcohol and secondary butyl alcohol in the above proportions again precipitating with about half the isopropyl alcohol previously used. The first solution is precipitated with isopropyl alcohol again and then the alcohol is separated from the resulting oil fractions by distillation.

* * *

Lubricating oil. No. 2 096 905, *issued Oct.* 26, 1937; *filed Aug.* 22, 1935; *E. Lieber, assignor to Standard Oil Development Co.; no drawing;* 14 *claims.*

A small quantity of an ester containing an element selected from the group of sulfur, selenium and tellurium directly connected to an aromatic ring is added to a lubricant. Objects are to increase resistance to oxidation and improve oiliness characteristics.

* * *

Dewaxing. No. 2 098 007, *issued Nov.* 2, 1937; *filed June* 8, 1934; *D. B. Mapes and E. M. Dons, assignors to Mid-Continent Petroleum Corp.; one drawing;* 4 *claims.*

Propane is employed in a continuous dewaxing process under conditions which permit the wax-containing oil to be suddenly chilled while it is flowing from a source of supply to a separating station.

In the process, wax-containing oil is dissolved in propane, the solution cooled until a cloud of wax appears, and then suddenly cooled to quickly precipitate wax. The latter cooling is accomplished by introducing a stream of chilled propane into the stream of solution. Additional wax is precipitated while being forced through piping to gradually decrease pressure on the flowing stream and gradually evaporate a portion of the propane. The precipitated wax is then separated.

* * *

Cracking. No. 2 098 057; *issued Nov.* 2, 1937; *filed May* 23, 1934; *J. W. McCaffrey, assignor to Universal Oil Products Co.; one drawing;* 7 *claims.*

A single cracking furnace is employed for topping and cracking operations. This is accomplished by passing the charging stock through a centrally located zone in the furnace where heat conditions are mildest and then to the fractionating zone. Selected high-boiling fractions are passed through conduits adjacent to the floor where they are rapidly heated to conversion temperature. Selected low-boiling fractions are passed through conduits adjacent the roof where they are converted and then through conduit exposed to the most severe heating conditions.

* * *

Hydrogenation. No. 2 098 400, *issued Nov.* 9, 1937; *filed*

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Dec. 22, 1932; *M. Pier, W. Simon and W. Kroenig, assignors to Standard-I. G. Co.; one drawing;* 3 *claims.*

A catalyst comprising a mixture of tungsten sulfide and manganese bromide is employed with a hydrogenating gas of a distillable carbonaceous material at 250-700° C. (480-1290° F.) and at 20 atmospheres or more.

* * *

Decarbonizing. No. 2 099 350, *issued Nov.* 16, 1937; *filed May* 17, 1935; *W. C. Stoesser, assignor to The Dow Chemical Co.; no drawing;* 5 *claims.*

Formation of carbon due to passage of hydrocarbon vapors at cracking temperatures through iron or carbon steel apparatus is prevented by the action of ammonia at a nitridizing temperature (570-1290° F.). The treatment with ammonia may be carried out in situ with apparatus completely assembled for use in the pyrolytic process.

* * *

Polymerization. No. 2 099 755, *issued Nov.* 23, 1937; *filed Dec.* 13, 1934; *R. F. Ruthruff, assignor to Standard Oil Co. (Ind.); one drawing;* 6 *claims.*

A gas-polymerizing process is provided in which polymerized products heavier than the desired motor-fuel products may be cracked back into gaseous olefins again suitable for polymerization.

Polymerized olefins are fractionated to separate products boiling within the motor-fuel-boiling-point range. Higher boiling products are subjected to temperatures of 1250-1750° F. under relatively low pressure in the presence of hydrocarbon gases containing paraffins to produce gaseous olefins which are delivered to the gas-polymerizing step.

* * *

Treatment. No. 2 099 835, *issued Nov.* 23, 1937; *filed Sept.* 2, 1933; *E. H. Barlow, A. P. Hewlett, and P. E. Kuhl, assignors to Standard Oil Development Co.;* 2 *drawings; one claim.*

Finished gasoline is produced from cracked naphtha having at least 0.12% sulfur by fractionating to remove any gas and to obtain three liquid portions. A light portion having an end point (Engler) of 270° F. is very susceptible to sulfur reduction by alkali treatment. An intermediate portion having an end point of 315° F. is only slightly susceptible by this treatment but very susceptible to sulfur reduction by sulfuric acid treatment, with large losses. The heavy portion is very susceptible to sulfur reduction by acid treatment with only slight treating losses.

The light portion is stabilized separately and treated with alkali, and the heavy portion treated separately with sulfuric acid, being redistilled to remove polymers. These two portions are blended with the untreated intermediate portion and the blend is doctor sweetened.

* * *

Motor fuel. No. 2 099 850, *issued Nov.* 23, 1937; *filed July* 2, 1930; *F. A. Howard, assignor to Standard Oil Development Co.; no drawing,* 3 *claims.*

A fuel for high compression engines consists of a hydroformed oil having a flash point above 100° F., an end point below 500° F. and anti-knock properties at least equal to those of a sweet uncracked gasoline from Mid-Continent crude, to which 30-50% benzol has been added.

Hydroformed oils are prepared by subjecting a gas oil, kerosine, or other heavy oil to the action of hydrogen at 100-200 atmospheres pressure and temperature of 950-1000° F. Catalyst may be oxide or sulfide of metals in the sixth group of the periodic system.

* * *

Cracking. No. 2 100 062, *issued Nov.* 23, 1937; *filed April* 3, 1935; *J. W. Throckmorton, assignor to Gyro Process Co.; one drawing;* 8 *claims.*

A cracking process is provided where vapors are separated from unvaporized oil in an evaporating zone and the latter combined with charge oil in a flash zone at lower pressure to be cracked in liquid phase. Vapors are cracked in the vapor phase. The reactant from the vapor phase cracking operation is quenched to below cracking temperature by means of cooler quench oil.

The reactant is separately separated from the liquid phase cracking operation and the quenched reactant into vapors and unvaporized oil at elevated pressure. The last mentioned vapors are fractionated in a single fractionating zone at the same pressure. Unvaporized oil from each zone is returned to the flash zone. Vapors are removed and condensed from the fractionating zone as a distillate product.

Principal object is to permit maintenance of higher temperatures in the evaporator without coking. Another object is to reduce heat load on the vapor phase cracking coil and reduce fuel consumption by maintaining a higher temperature of the vapors passing to the vapor phase cracking coil. Another object is to limit the quantity of very low boiling hydrocarbons in the vapors and to employ fractionating and separating equipment of smaller size.

* * *

Cracking. No. 2 100 800, *issued Dec.* 7, 1937; *filed Oct.* 29, 1934; *H. C. Schutt, assignor to Gyro Process Co.;* 3 *drawings;* 2 *claims.*

Improvement is made to a cracking process which includes the steps of passing a stream of oil through a conversion zone to form lower boiling hydrocarbons, reducing pressure on products to separate vapors and a primary liquid residue. Vapors are subjected to vapor phase cracking conditions and products cooled with cooler oil to condense the refractory higher boiling hydrocarbons of the cracked vapors. Condensed refractory oil is separated from uncondensed cracked vapors and the latter passed to a fractionating zone to be dephlegmated. Desired low boiling hydrocarbons are recovered from uncondensed overhead products.

Improvement consists of withdrawing from the fractionating zone an intermediate fractional oil condensate lower boiling than the refractory higher boiling hydrocarbons and employing the condensate as the cooler condensing oil and as reflux oil in separation of the refractory oil from uncondensed cooled cracked vapors. Condensed refractory oil is diverted as a secondary residue. Primary liquid residue is passed to a separate distillation zone where primary lower boiling hydrocarbons of the residue are vaporized. Vapors and unvaporized residue are withdrawn separately from the distillation zone and vapors cooled to condense them. Condensate resulting is passed to the fractionation zone from whence is withdrawn a stream of oil for passage to liquid phase conversion zone.

* * *

Resins. No. 2 099 090, *issued Nov.* 16, 1937; *filed Feb.* 7, 1936; *W. L. Webb, assignor to Standard Oil Co. (Ind.); no drawing;* 6 *claims.*

In the process of making high molecular weight products from reactive olefins by polymerization of mixtures of iso-olefin hydrocarbons with other olefins in the presence of a metal halide catalyst hydrolizable by water, the catalyst is deactivated below 0° F. after the desired polymerization reaction is complete and before the temperature is allowed to rise to a point where the polymerization of other olefin hydrocarbons occurs. Deactivation is accomplished with a fluid hydrolytic agent selected from a class consisting of ethyl alcohol, methanol, isopropyl alcohol, glycol, glycerol, and water-containing ethyl ether, methyl ether, acetone, methyl ethyl ketone, furfural and acetaldehyde.

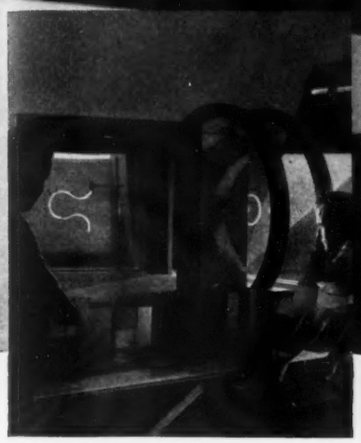
* * *

Halogenation. No. 2 099 231, *issued Nov.* 16, 1937; *filed June* 10, 1935; *J. D. Ruys and J. W. Edwards, assignors to Shell Development Co.; no drawing;* 20 *claims.*

A halogen addition product is produced by reacting a hydrocarbon possessing an olefinic linkage between two aliphatic carbon atoms with an amount of a halogen not in excess of that theoretically required to completely react. Reaction takes place at superatmospheric pressure and practically anhydrous conditions in the presence of a catalyst comprising dehydrated calcium chloride at 20-120° C. (68-248° F.).

Principal object is to produce saturated polychlorides having at least two chlorine atoms to the molecule, one chlorine atom being linked to each of two vicinal carbon atoms. Such products include 1,2-dichlorethane, 1,2-dichlorpropane, 1,2-dichlorbutane, and 2,3-dichlorbutane. Another object is removal and recovery of the olefin content of gaseous mixtures. Ethylene dichloride may be obtained from industrial gases containing as little as 2% of ethylene.

IT'S WHAT'S INSIDE THAT COUNTS!



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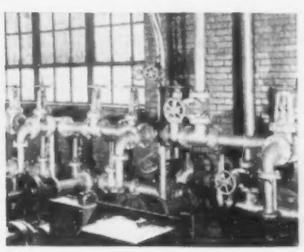
Dimensions at Crane are checked on every valve. Here, for instance, the taper of a wedge gate is checked for the accuracy that will mean sure fit and long life when the valve gets into service. The average Crane valve passes over 40 inspections and tests to make sure that its goodness is uniform throughout.



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PLUMBING • HEATING • PUMPS

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Activities OF EQUIPMENT MANUFACTURERS

NICKEL ALLOY INDEX—A complete list of current literature on production and industrial applications of nickel alloy steels, nickel cast irons and nickel alloyed nonferrous castings is offered by International Nickel Co., 67 Wall St., New York. Publications are listed by industrial fields, including petroleum and by applications.

* * *

LABORATORY INSTRUMENTS—A 100-page book entitled "Chemical & Biological Laboratory Instruments" and designated as Catalog No. 38 NP is announced by American Instrument Co., 8010 Georgia Ave., Silver Spring, Md.

* * *

VANADIUM—Vanadium in Cast Iron, a new 28-page booklet just issued by Vanadium Corp. of America, 420 Lexington Ave., New York, describes the properties of cast irons alloyed with vanadium.

* * *

BLOW-OFF VALVE—A new line of boiler blow-off valves incorporating a "Blo-Deflector" protecting lip is announced by the Hancock Valve Division of Manning, Maxwell & Moore, Inc., Bridgeport, Conn. The makers claim this design principle deflects boiler blow so effectively that the valves are almost indestructible. Wear resistance is further increased by the use of stainless steel valve discs hardened to 500 Brinell. Renewable valve seat rings are heavily Stellited.

* * *

INDUCTION MOTORS — Fairbanks-Morse vertical hollow and solid shaft polyphase, ball-bearing, squirrel-cage, induction motors are described in new bulletin 1410. The motors were developed primarily for direct-connection to vertical-shaft turbine, propeller and centrifugal type pumps.

* * *

J. W. Dunbar, formerly in charge of magazine advertising for the Incandescent Lamp Dept. of General Electric Co., Cleveland, has been appointed assistant to C. H. Lang, advertising manager of the company. Mr. Dunbar's headquarters will be in New York where he will devote his principal attention to the selection of media.

* * *

PYROMETER CHECKING SET — The Thwing "Treasure Chest", a pyrometer checking set, is announced by Thwing-Albert Instrument Co., 3339-41 Lancaster Ave., Philadelphia, in Leaflet A 3716. The set operates on the potentiometer principle. It is portable and can be used to check potentiometers, thermocouples, and all types and makes of pyrometers, it is said. It is said to be the only potentiometer equipped with an auxiliary electromotive force to be impressed into other instruments as a means of checking.

* * *

BOILER REGULATOR — Northern Equipment Co., Erie, Pa., announces Bulletin 409-A covering the Copes Flowmatic regulator which feeds boilers automatically according to steam flow. Industrial plant applications include waste-heat boilers, oil refinery boilers where firing with acid sludge varies the steaming rate, and boilers handling mine hoist loads.

* * *

CHEMICALS — The Mathieson Alkali Works, 60 E. 42nd St., New York, has just published a 36-page booklet tracing the company's development and processing operations. A chart of users and uses of the chemicals is included which shows 81 different industries which use one or more of the products listed.

* * *

NEW FOLDER — The International Nickel Co., 67 Wall St., New York, is distributing a new folder, "Nickel Alloys for High and Low Temperature Refinery Service", which treats briefly on the high and low nickel-chromium alloys having good strength and creep resistance at elevated temperatures.

* * *

HARD ALLOY BULLETIN—Tantaloy Tipped Tools is the title of a new bulletin of Fansteel Metallurgical Corp., North Chicago, describing uses for a hard alloy containing tungsten, cobalt, and tantalum carbide, particularly for lathe tools. Tantaloy is tipped to steel shanks or tips are available to concerns who wish to make their own tools.

* * *

RESEARCH FELLOWSHIPS—Five post-doctorate fellowships for research in modern physics at the Westinghouse Research Laboratories, East Pittsburgh, will be offered this spring to young scientific workers, it is announced by Westinghouse Electric & Mfg. Co. Five more will be appointed a year later. Appointments will be for one year and fellows will be eligible for one reappointment. Candidates are expected to propose a problem within the field of the laboratory's activities. The plan provides ultimately an opportunity to continue in the employ of the company.

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(*See also page 128*)

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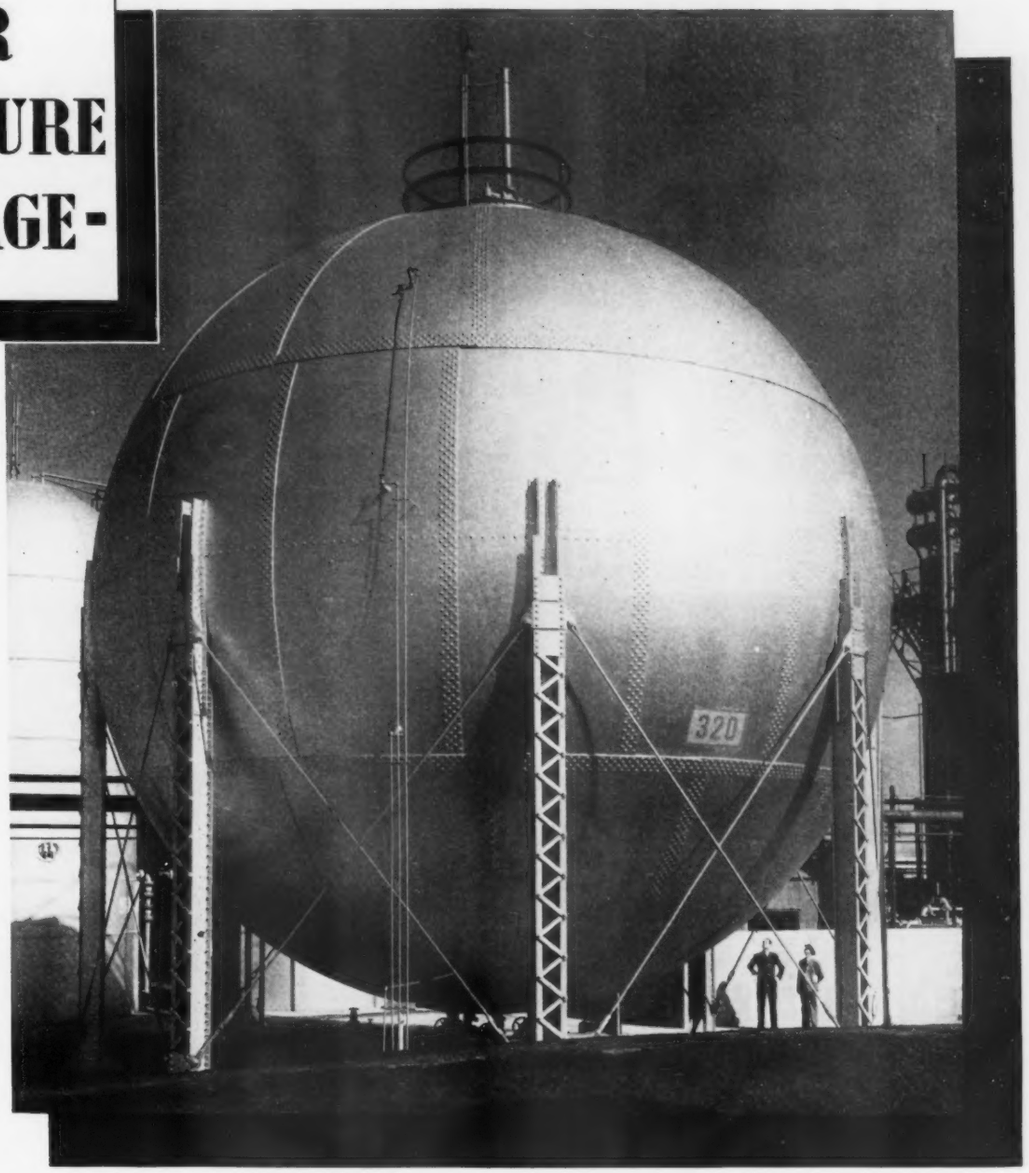
FOR PRESSURE STORAGE-

The HORTONSPHERE



THE 5,000 bbl. Hortonsphere shown above is located at the Wilmington, California, refinery of the Shell Oil Company. It is being used to store refinery gasoline under pressure.

Oil products volatile enough to boil at atmospheric temperatures should be stored in pressure tanks. This has not always been done, due to the high cost of such facilities in small units.

In the Hortonsphere, you get a balanced combination of economy, efficiency and safety. It is built in large capacities, providing an economical cost per barrel of storage. It eliminates venting during standing storage, thus preventing evaporation losses due to breathing and boiling. Pumping losses are also eliminated (after the first filling) by the recondensing of vapor during filling.

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Similarly, the Hortonspheroid is widely used for storage of natural gasoline at pressures up to 25 lbs. per sq. in. It is also built in large sizes for high test motor fuel storage at low and medium pressures. For complete information address our nearest office.

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Tulsa ..... 1607 Hunt Bldg.	Detroit ..... 1513 Lafayette Bldg.	Los Angeles ..... 1422 Wm. Fox Bldg.
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Petroleum Engineering Opens Houston Office

TULSA, Jan. 5.—Petroleum Engineering Inc., of Tulsa has established a branch office at Houston, Texas, according to announcement by P. M. Raigorodsky, general manager of the company.

This office is in charge of H. W. DeYarmett, who has several years' experience in designing, building and operating natural gasoline and similar types of plants in the southwest.

The address of the new office is Suite 1714, Second National Bank Bldg., Houston.

H. W. DeYarmett, recently placed in charge of the Houston office of Petroleum Engineering, Inc.

Lummus Co. Installs Los Angeles Office

LOS ANGELES, Jan. 5.—The Lummus Co. of New York established a branch office in Los Angeles just befor the holidays, in charge of V. O. Bowles. The new office is located at 411 West Fifth Street.

To place the new branch in working order, Dr. E. R. Smoley, of the Lummus company, is spending some time in Los Angeles with the Pacific Coast new manager, supervising the work.

Dr. E. R. Smoley

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By E. N. KLEMGARD

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Lubricating

THE 1938 AUTOMOBILES

Increase in Hypoid-Equipped Cars; Less Frequent Oil Drain Periods; "Automatic" Transmissions and Off-the-Floor Shift Levers Offered.

By JOHN W. THOMPSON
N. P. N. Staff Writer

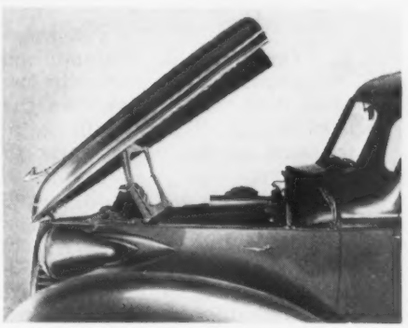
ALTHOUGH the drum-beating and bugle-blowing for the 1938 cars centered principally around the many new types of transmission shifting devices, automatic, semi-automatic, and otherwise, the service station operator need not burden his mind over their apparent intricacies, for with but one exception the lubrication requirements of these units are limited mainly to rod linkage.

Instead, there are other far more important 1938 features to command the station operator's attention. Recommendations for crankcase oil drain periods, for example, have been stretched anywhere from 200 to 500 per cent.

Studebaker, probably the outstanding radical in this respect, recommends seasonal oil changes provided the oil filter cartridge is replaced when the oil appears dirty. Lincoln-Zephyr now recommends 5000-mile changes. Packard, Chevrolet, Pontiac, Buick, Oldsmobile, LaSalle and Cadillac have boosted the drain periods until they now specify "every 2000 to 3000 miles under normal driving conditions." All Chrysler-built cars, including Chrysler, DeSoto, Dodge and Plymouth, have widened the oil drain gap to 2500 to 3000 miles.

In view of these widened periods, one of the decorative banners which adorned the wall of the National Auto Show at New York last October brought a smile to some visitors. It read: "To Get The Most Out Of Your Car—Periodic Lubrication with Frequent Change Of Oil Means Minimum Engine Wear."

Instead of the confusing method of specifying the proper engine oil grade for various weather conditions, with its overlapping of temperatures, as formerly used, a number of car manufacturers, particularly General Motors and Chrysler, now specify grades on a basis of the minimum anticipated temperatures.



New method of hinging the one-piece hood on Hudson's new entry in the low price field, the Hudson 112. This car will not be publicly introduced until early in February

Missing from the new car picture this year are Auburn and Cord, who have decided to call it a day as far as passenger car manufacture is concerned. Chrysler has discontinued its Airflow model, and Cadillac has dropped the V-12 from its line. New cars to enter the scene for 1938 are the American Bantam and the Hupmobile. The latter returns after a year's financial "sit-down strike."

The popularity of hypoids increases. In 1936 there were 13 models so equipped; in 1937 the number of models with hypoids rose to 21; and for 1938 there are 31 models with hypoid axles. In addition to those models with hypoids last year, the new addi-

This type of hood, in which the horizontal side section lifts from each side, is used on Buick (shown here), Chrysler, DeSoto, Dodge, Hudson, Nash, LaFayette, Plymouth, Pontiac and Terraplane

A snap-spring door covers the gasoline filler pipe cap on the rear left fender of the 1938 Buick. (Photo copyright, Photo-Chek Service, Chicago)

tions include the large Cadillacs and Buicks, Hupmobile Eight, Graham, and Lincoln-Zephyr.

LaSalle, Studebaker, Cadillac and Chevrolet have seen fit, in view of the unexpectedly successful record of their hypoids in 1937, to discontinue the policy of recommending only factory-approved hypoid lubricants. Packard is now the only hypoid-equipped car in which a factory approved hypoid lubricant is required. Nash and LaFayette, although using a spiral bevel axle, recommended the use of a Nash-approved extreme pressure lubricant. An SAE 90 hypoid lubricant for all seasons is the dominating recommendation.

Buick now employs coiled rear springs, and makes a sales point of the fact that this revolutionary design eliminates eight shackle lubrication points. Packard, due to the generous use of anti-friction bearings and rubber bushings, has found it possible to recommend a chassis lubrication at 5000-mile periods, instead of the conventional 1000 miles.

There is wider adoption in the 1938 models of the so-called automatic transmissions and off-the-floor gear shift levers, which were originally expected to make their bow on the 1937 cars. These devices in various forms are offered as optional equipment on the following 1938 cars: Buick 40, Oldsmobile, Pontiac, Graham, Hudson, Terraplane, Nash, LaFayette, and Studebaker. The Cadillac and LaSalle models include one such device as standard equipment.

The type of "automatic transmission" now offered optionally on the Buick 40 is similar to that of the Oldsmobile (introduced originally on the Oldsmobile Eight in the summer of 1937). This is the only type which need concern the station attendant from a lubrication standpoint. In these instances, the transmission takes a grade of engine oil similar to that recommended for the crankcase. Further details of servicing and operation of this unit and the others mentioned above are included in the individual car stories on the following pages.

Hupmobile has been added to the list of users of the transmission overdrive. This unit is offered as optional equipment on the Chrysler Royal and Imperial, DeSoto, Graham, Hupmobile, Nash, LaFayette, and Studebaker. It is standard equipment on the Chrysler Custom Imperial, and Pierce Arrow.

The battery is now located under the hood on the following 1938 cars: American Bantam, Buick, Cadillac (except V-16), Ford, Graham, Hudson, LaSalle, Lincoln-Zephyr, Oldsmobile, Pontiac, Terraplane, and Willys. With the increasing use of this new battery location, service station operators should check the battery water more frequently, as the excessive engine heat increases the rate of evaporation.

The lift top, or alligator type, hood is now used on the Cadillac, Ford, Graham, Hupmobile, LaSalle, Lincoln-Zephyr, Studebaker, and Willys.

On the pages immediately following will be found the important lubrication requirements on the 1938 cars, with emphasis on the changes over last year. Each car, or cars of similar requirements, is described individually, offering the station operator a quick means of determining how the 1938 models differ from those of 1937.

BULLETIN

By Telegraph

● On Jan. 4, Hudson announced a new car in the low price field, to be known as the Hudson 112. The car will be introduced to the public early in February.

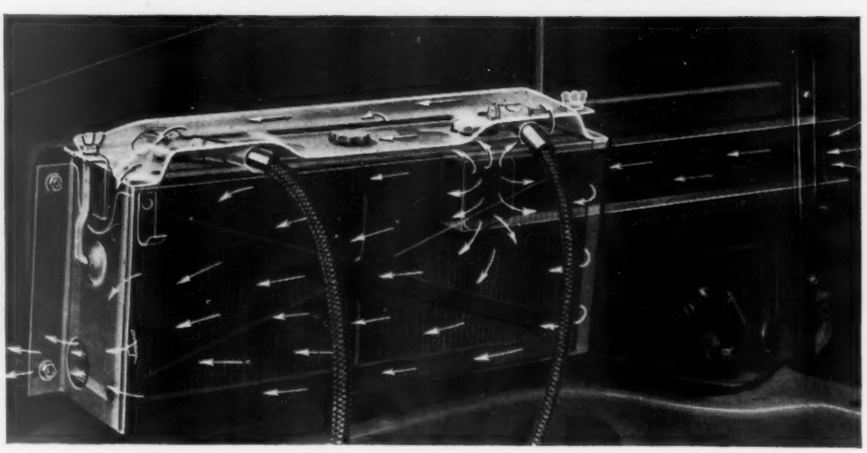
Mounted on a 112-inch wheelbase chassis, the new car measures 187½ inches overall. It is powered by a six-cylinder, 83-horsepower engine and equipped with hydraulic brakes with two mechanical reserve systems, similar to large Hudson and Terraplane models.

Servicing requirements from the standpoint of lubrication are identical to those of the Terraplane, with the exception that the crankcase capacity (refill) on the Hudson 112 is 4½ quarts, as compared to 5 quarts on the 1938 Terraplane.

The hood of the Hudson 112 is in one piece, similar to the alligator type, except that it hinges at the forward end and is supported midway of its length by folding brackets. The hood is lifted by first unlocking the handle on either side and lifting upward from the rear corner.

The battery is located under the hood on the left side, as in all Hudson-built cars for 1938.

NOTE: Data released by the manufacturer on this particular model was not received in time for mention in connection with other articles or statistics in this issue.



The battery is now located under the hood on the American Bantam, Buick, Cadillac (except V-16), Ford, Graham, Hudson, LaSalle, Lincoln-Zephyr, Oldsmobile, Pontiac, Terraplane and Willys. The Oldsmobile battery mounting, shown here, is provided with an air duct which leads cool air from the front end of the engine compartment to the battery

American Bantam . . .

Lubrication Servicing Divided Into 2000 and 5000-Mile Periods; Crankcase Capacity Five Pints

THE BANTAM "60", first model introduced by the American Bantam Car Co., with an overall length of 120 inches, is powered by a four-cylinder engine of 20 horsepower. The engine lubrication system has a force-feed.

Spring shackles, rear wheel bearings, fan shaft, steering gear and spindles, are to be lubricated every 2000 miles with a chassis lubricant. while the generator, distributor, and control shaft, also 2000-mile points, require an engine oil for lubrication. The distributor cam should be greased every 2000 miles.

The front spring is of the transverse type while the rear is of the conventional type.

The transmission and differential both require a drain and refill twice a year, using SAE 160 in summer and SAE 90 in winter.

Engine oil should be drained every 2000 miles. For summer an SAE 30 or 40 is recommended, and for winter, an SAE 20 or 10.

The front wheel bearings and both ends of the drag link are to be packed with wheel bearing lubricant every 5000 miles and at similar intervals the starting motor takes a few drops of light engine oil.

The transmission and differential each have a capacity of "2 or 3 pints". The crankcase has a 5-pint capacity, while the cooling system takes 6 quarts, and the fuel tank, 5 gallons.

• • •

Buick . . .

All Models Equipped with Hypoid Rear Axles; Coiled Rear Springs Eliminate Eight Lubrication Points

BUICK enters 1938 bearing the same model numbers as in 1937—the series 40, 60, 80 and 90. At least three new engineering developments are featured in the new line.

First, a new piston design has been developed which, it is claimed, substantially increases power and gasoline economy without increasing the bore or stroke or otherwise changing the size of the engine.

Second, a new type of rear suspension, involving the use of coil springs which are said to improve riding and steering qualities, has been introduced. This new rear spring design has eliminated eight shackle lubrication points.

Third, a new self-shifting transmission is offered as optional equipment on the small Series 40 cars only, at extra cost. A new gear ratio is provided by this feature, and gears are shifted automatically. The Series 40 Buick, incidentally, represents about 70 per cent of Buick's total production.

The hood lifts from each side from the molding line, while the hood side panels are stationary, making it necessary for the station operator to "work in a well" while lubricating such engine parts as the distributor, starter and generator.

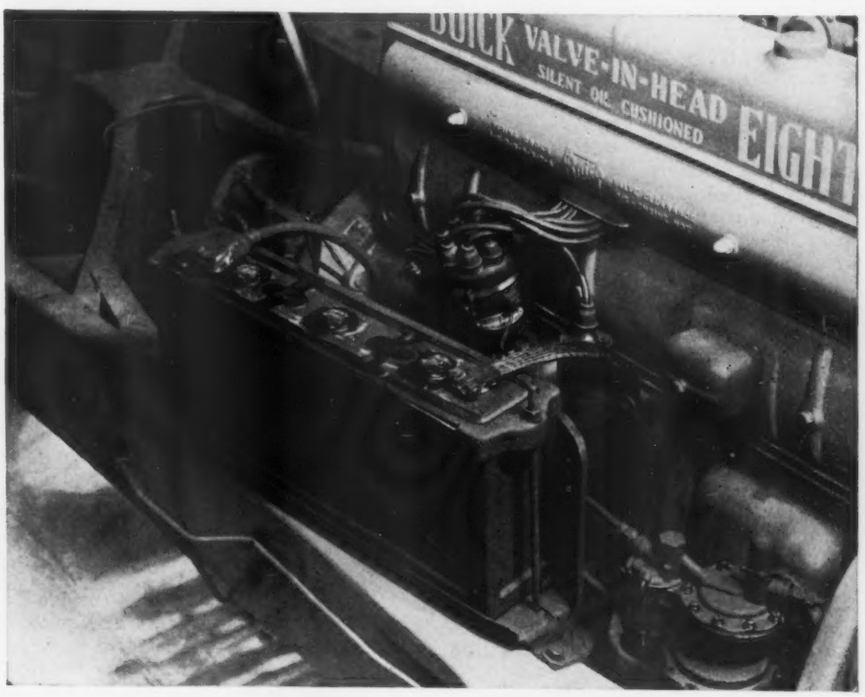
The engine oil fill pipe opening is now located on the top of the rocker arm cover for more convenient servicing, and the new thin type battery is located under the hood on the right side.

The gasoline tank filler cap on the 1938 Buicks has been placed under the left rear fender, completely smoothing up the rear end. Access is through a small door in the fender.

Buick uses a specially designed oiling system that forces oil under pressure to all main, connecting rod, cam shaft and rocker arm bearings, besides providing a spray of oil on cylinder walls and a constant supply to such parts as timing chain and valve lifter mechanism.

Buick's new type coiled rear springs are suspended in combination with airplane type shock absorbers and a radius rod that locates the rear axle and wheels sidewise. The mounting of these springs consists of a spring seat on the rear axle housing behind the axle, increasing the spring base by about five inches.

Structural features claimed for the



The battery on the 1938 Buick is located under the hood on the right side of the engine.

new torque free springing include the replacement of the multi-leaf springs by one-piece coil springs, elimination of shackles and the elimination of lubrication service on the rear suspension, with the result that eight shackle points formerly requiring lubrication are no longer present.

Buick's knee action front wheels have been improved for 1938 by the addition of threaded steel bushings in the lower control arms, better to resist wear and to retain lubricants.

The steering linkage on the Series 40 and 60 is new and incorporates direct cross steering. It is considerably simplified through the elimination of more than a dozen parts and assemblies and has made possible the discontinuance of four lubrication points.

The new self-shifting transmission, available on the Series 40 only as optional equipment, will shift itself once the car is under way and automatically provides a selectivity of gear ratios. Controls are located on the steering post just under the wheel and the center gear shift lever has been eliminated from the floor.

The automatic transmission is similar to that used on the Oldsmobile for 1938, and includes a fourth speed direct drive. Claims for this device include 80 per cent less clutch operation, about 18 per cent reduction in engine r.p.m., greater gasoline mileage and improved oil economy.

An innovation on the 1938 cars is the use of the coiled rear springs on the new Buicks. Eight shackle lubrication points have been eliminated by the adoption of this design

All 1938 Buicks are equipped with hypoid rear axles. Last year only the Series 40 and 60 were so equipped.

Little change has been made in the recommendations for oil drain periods. Where formerly every 2500 to 3000 miles was recommended, the 1938 specifications call for a drain every 2000 to 3000 miles under "normal driving conditions," thus conforming to the general recommendation being observed on all General Motors cars for 1938.

In recommending the use of oil grades for various temperatures, Buick has done away with the confusing "thermometer" chart with its overlapping of certain grades. Instead the owner is urged to use the grade in accordance with the anticipated minimum atmospheric temperature, as follows:

Not lower than 32 deg. F. 20-W or SAE 20
As low as plus 10 deg...20-W
As low as minus 10 deg. 10-W
Below minus 10 deg.....10-W+10% kerosine

The knee action lubrication points on all 1938 Buicks remain the same as last year. The steering linkage on the new Series 80 and 90 also remains unchanged. On the 40 and 60, however, the direct cross steering design has eliminated the intermediate steering arm point as well as reducing the number of tie rod points. These front end chassis points require a chassis lubricant every 1000 miles, as formerly.

A CHASSIS lubricant is also required at the brake pedal shaft on all models this year, where formerly it was necessary on the Series 60 only. Also the clutch pedal, which required a chassis lubricant on the Series 60, 80 and 90 last year, is included on all models for 1938. These are also 1000-mile points.

On the Series 80 and 90 it is necessary to remove the plug at the forward end of the propeller shaft and fill with 10-W engine oil every 1000 miles. This point was found only on the Series 90 last year.

Rear axle and conventional transmission are to be drained, flushed and refilled twice a year or every 10,000 miles. Last year the recommendation for these points stated "twice a year or every 6000 miles."

The rear axle on all models takes an SAE 90 hypoid lubricant for temperatures not lower than 10 degrees below zero. For temperatures lower than that, an SAE 80 hypoid lubricant is recommended. The oil level should not be lower than ½-inch below the filler plug. Only flushing oils should be used in the rear axle for cleaning out. The attendant is cautioned against using gasoline, kerosine, or steam.

It is important that a hypoid lubricant NOT be used in the transmission. The conventional transmission takes an SAE 160 or 140 for summer and an SAE 90 for winter. The SAE 140 recommendation has been added for 1938.

Capacities, with the exception of the automatic transmission, remain the same as last year. Crankcase capacity of the Series 40 is 6 quarts, and of the remaining models, 8 quarts. The conventional transmission capacity of the 40 is 1¾ pints, and on the other models it is 2½ pints. The rear axle capacity of the Series 40 and 60 is 3 pints, and of the 80 and 90, 4 pints.

Lubricating the Buick Self-Shifting Transmission

The automatic transmission, available only on the Series 40 Buick as optional equipment, is lubricated as follows:

EVERY 1000 MILES

Check for oil level. The transmission should be completely full of oil at all times. If the level is permitted to get to low there is danger of "sucking air."

The oil level gauge is exposed when inspection hole cover is removed from the center panel of the driving compartment floor. Oil may be added through the level gauge hole in the case.

FIRST 2000 MILES

Oil should be completely changed at the 2000-mile inspection period. At this time the oil pan should be dropped for a thorough cleaning to remove any sediment or foreign matter. It is recommended that a new cork gasket be used when replacing the pan. The attendant is cautioned against using shellac, permatex or any sealer on the transmission gaskets, excepting the transmission to the flywheel housing gasket.

EVERY 10,000 MILES

Oil should be completely changed and the pan thoroughly cleaned as instructed above.

Seasonal changes, based on anticipated atmospheric temperatures, are required in accordance with the following tabulation, selecting oils on the basis of minimum atmospheric temperature:

40 deg. F. and above SAE 30 engine oil
32 deg. .....SAE 20 or 20-W
10 deg 20-W
Minus 10 deg.....10-W
Below minus 10 deg..10-W+10% kerosine

Seasonal changes require only the removal of the drain plug at the lower front end of the transmission. Elevating the rear end of the car facilitates this operation.

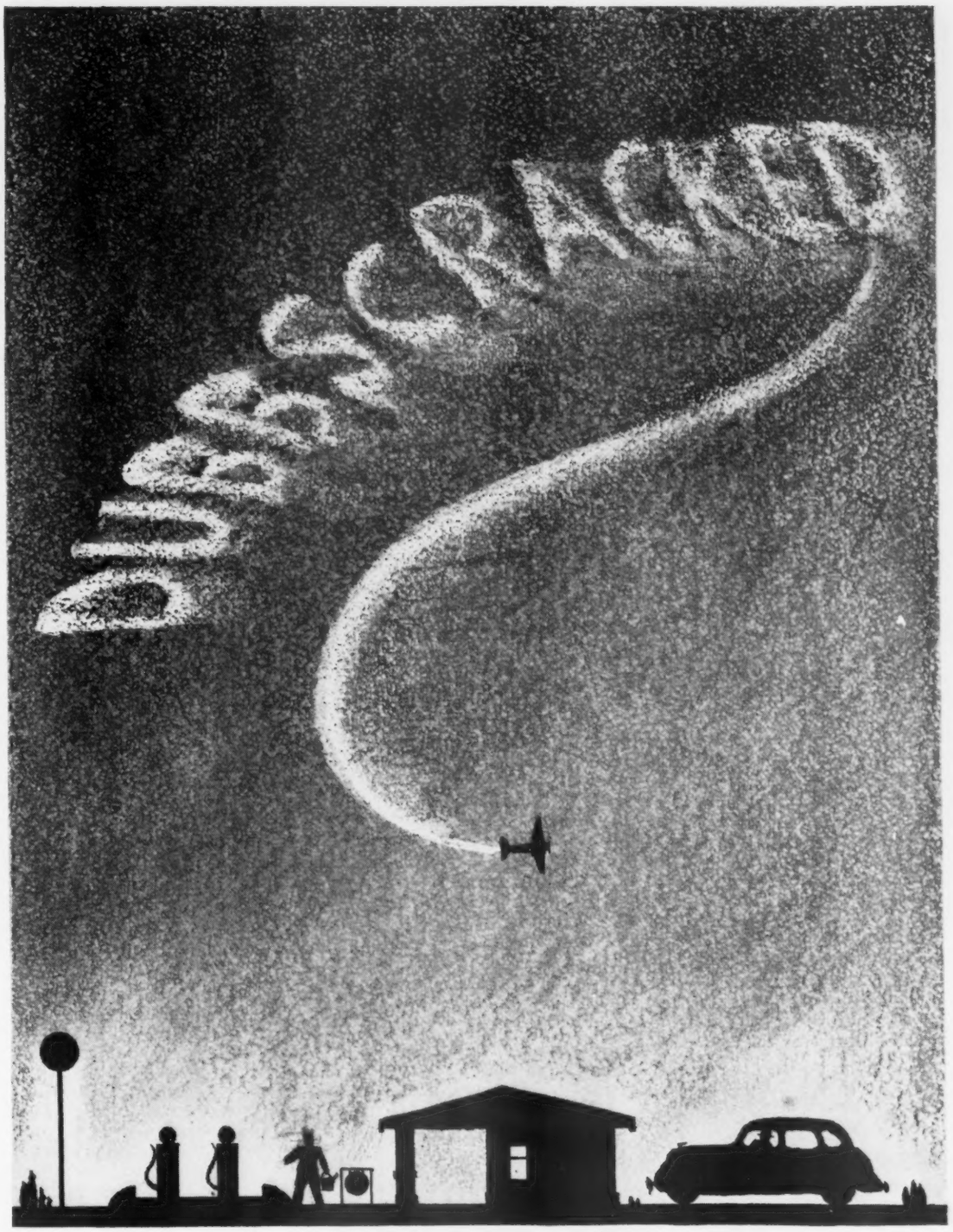
The attendant is cautioned against using transmission oils or oils containing special ingredients in the automatic transmission.

CAPACITY OF TRANSMISSION

Refill .....3 quarts
Dry transmission .....3½ quarts

The Buick service department recommends that the replacement of the cork gasket and the adjustment of the Servo bands in the self-shifting transmission, operations which are both necessary at 10,000 mile periods when the pan is removed for cleaning, be done by Buick dealers.

It is recommended that oil service stations take care of only the seasonal changes, which require only the removal of the drain plug and the addition of oil as specified above.



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Cadillac and LaSalle . . .

Drops Factory-Approval Restriction on Hypoid Lubes: All Models Have Hypoids; Battery Under Hood On All But V-16 Model.

CADILLAC AND LASALLE enter 1938 with three engines, the LaSalle V-8, the Cadillac V-8, and the Cadillac V-16. The V-12 has been dropped this year.

Hypoid rear axles are now included on the entire line, and the factory-approved type of lubricant recommendation has been discontinued. Oil filters, which were formerly standard equipment, now appear only on the V-16, in spite of the fact that the 2000-mile crankcase oil drain period recommendation of 1937 has been increased to "every 2000 to 3000 miles under normal driving conditions", to conform to the 1938 General Motors policy on all of its cars.

The hoods of all 1938 Cadillacs and LaSalles are of the lift-top, alligator type and, with the exception of the V-16, all batteries are now located under the hood on the right hand side. Servicing of the battery is done from inside the hood, but removal must be made from the outside, underneath the right front fender.

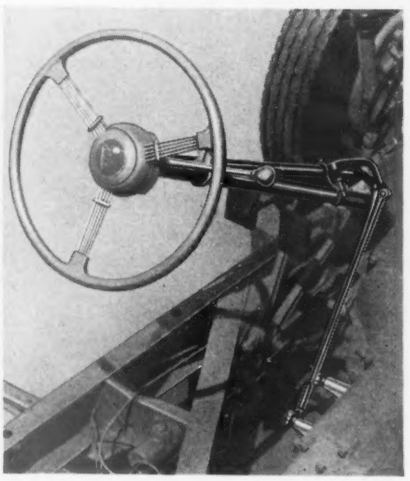
As standard practice on all models, the gear shift lever has been located on the steering column, instead of on the floor. This is a manual shift, as before, and there is nothing new to learn in its operation except that the lever now takes a horizontal position instead of vertical.

One of the features along the 1938 automotive front is the Cadillac V-16 engine. The two banks of eight cylinders each are mounted at a 135-degree angle, making the block design practically "flat".

The new V-16, while developing the same 185 horsepower as in 1937, weighs 250 pounds less, and its displacement has been reduced 21 cubic inches, to 431 cubic inches. Its length has also been reduced 10 inches.

Engine oil recommendations are now on a basis of anticipated minimum atmospheric temperatures, developed by General Motors for 1938. During cold weather, when the anticipated minimum temperature is not lower than 32 degrees, a 20-W or SAE 20 is recommended; for as low as 10 degrees, a 20-W oil; for as low as minus 10 degrees, 10-W; and below minus 10 degrees, 10-W plus 10 per cent kerosine. The latter grade is recommended only for those territories where the temperature falls below 10 degrees below zero for long periods.

During summer weather, it is pointed out by Cadillac engineers that the use of 20-W or SAE 20 will permit better all-around performance of the engine than will heavy body oils. SAE 30 may be used if it is expected that the average prevailing daylight temperature will be 90 degrees F. or above, or if the car is regularly driven at high speeds.



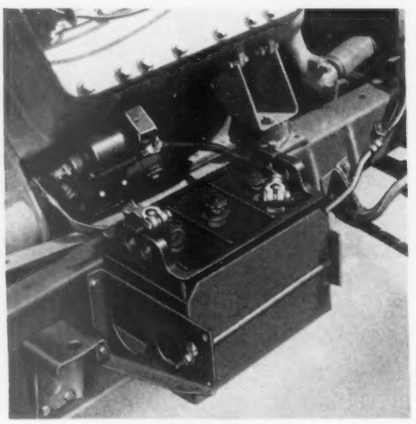
The gear shift lever, standard equipment on all 1938 Cadillac and LaSalle models, is mounted on the steering column, leaving the floor unobstructed. Lever and clutch action are the same as in the conventional type of shift, except that the shifting lever, formerly in a vertical position, has been swung up into a horizontal plane. The "H" motion of the lever still remains. This shift is manually operated, requiring no vacuum equipment nor any transmission change

As previously mentioned, the crankcase should be drained every 2000 to 3000 miles under normal driving conditions. Eliminating the former requirement that a factory-approved hypoid lubricant be used in the hypoid axle, Cadillac and LaSalle now recommend the use of an SAE 90 hypoid lubricant for all seasons. The lubricant level should be checked every 1000 miles, instead of every 3000 miles as formerly. This change was made early in 1937. The axle should be drained, flushed and refilled with fresh lubricant every 6000 miles, regardless of season.

Where the temperature drops below 10 degrees below zero for long periods, an SAE 80 hypoid lubricant is recommended for the rear axle.

The transmission is to be lubricated all year round with an SAE 90 or SAE 90 e.p. gear oil. The lubricant level should be checked every 3000 miles, and the case drained, flushed and refilled every 6000 miles.

With but few exceptions the chassis lubrication requirements of the Cadillac and LaSalle are similar. On the LaSalle, the front end of the rear spring (the spring bolt) takes a chassis lubricant every 1000 miles, but on the Cadillacs this point does not require attention. The pedal shaft on the LaSalle has two fittings which take a chassis lubricant every 1000 miles, while on the Cadillac V-8 "60" there are two oil holes in which an oil can be used to apply engine oil every 1000 miles to wicks. Engine oil was also used on the LaSalle at this point last year.



Batteries on the 1938 Cadillac and LaSalle, except the V-16, are mounted on the outside of the frame under the hood to facilitate service. To remove the battery necessitates reaching under the front fender from the outside

THE rear spring shackles have two fittings on each side on the Cadillac "60" and LaSalle, while on the other Cadillacs there is one fitting on each side. These take a chassis lubricant every 1000 miles.

The timer-distributor, as well as the water pump, takes a water pump grease every 1000 miles. The former is equipped with a grease cup, while the water pump has a fitting for a grease gun.

The steering mechanism and independent front wheel suspension points on the LaSalle and Cadillac "60" total 21 each, the same as last year. On the Cadillac "65" and "75" there are 22 points, also unchanged. These take a chassis lubricant every 1000 miles, as formerly.

The two rear stabilizer links, which last year appeared on the Cadillacs and took a chassis lubricant, have been replaced on the 1938 line by a new design.

On all LaSalle and Cadillac V-8 models, capacities remain practically the same. The crankcase takes 7 quarts, and the transmission 2½ pints. On the LaSalle and Cadillac "60", the rear axle capacity is 5 pints, while on the remaining V-8s it is 6 pints. On the Cadillac "60" the cooling system capacity is 24 quarts, and on the remaining V-8s it is 25 quarts.

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Chevrolet . . .

Discontinues "Approved" Hypoid Recommendation; Oil Change Period Set at 2000 to 3000 Miles

CHEVROLET again in 1938 introduces two models—a Master and Master DeLuxe model. As in 1937, the two models are similar except for front spring suspension and minor refinements.

The 1938 Master is equipped with a conventional I-beam front axle and semi-elliptical springs, while the Master DeLuxe has fully-enclosed knee action units.

The engine in both models is an 85-horsepower, valve-in-head type. Among the most notable changes in connection with the power plant is the electrical system. A new higher capacity generator is used, with a 28-ampere average maximum, compared with 19½ last year. A voltage regulator, as well as a new starting mechanism with over-running clutch and automatic throttle advance are also featured. The new models are also equipped with a weather-tight, dust-proof, and accessible battery mounting, located under the front compartment floor board.

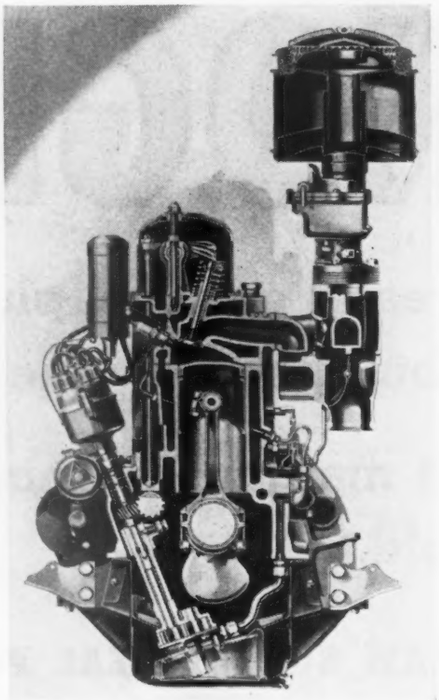
Rear springs are completely insulated from the rear axle housing by rubber bushings and washers, used in conjunction with a new bracket welded to the front of the housing on each side. Thus there is no need for lubrication, adjustment or service of any kind at this point. The spring saddles were formerly lubricated with a chassis lubricant every 1000 miles.

Another change on the 1938 Chevrolet is in the clutch, where a ball throwout bearing replaces the graphite bearing used in previous years. The new bearing, of a sealed type, is packed with a high temperature lubricant which makes further lubrication unnecessary.

Chevrolet continues with the hypoid rear axle in 1938. After a year remarkably free from trouble on the servicing of this unit, Chevrolet for 1938 is leaving behind its recommendation that an "approved" hypoid lubricant be used, and is specifying that an SAE 90 hypoid lubricant be used throughout the year, with an SAE 80 hypoid lubricant being recommended where extremely low temperatures are encountered for protracted periods during the winter months.

While seasonal changes of the hypoid lubricant are not required by Chevrolet, it is recommended that the housing be drained and refilled at least twice a year, or every 6000 to 10,000 miles under severe service conditions. Last year the 10,000-mile limit was not recommended.

Provided the type of hypoid lubricant is changed when draining is done, it is recommended that the axle housing be flushed out with a light flushing oil. The owner is cautioned against the use of water, steam, kerosine, gasoline, or alcohol for flushing.



A sectional end view of the 1938 Chevrolet six-cylinder valve-in-head engine

For the transmission, an SAE 90 gear lubricant is recommended for all seasons, except for extremely long periods of very cold weather, when an SAE 80 is recommended. Chevrolet specifies that the transmission be drained and washed out with a light oil twice a year, or approximately every 6000 to 10,000 miles. Here also the 10,000-mile limit is new this year.

The SAE 90 transmission specification for all seasons was first introduced by Chevrolet in April, 1937. Prior to that time an SAE 160 was recommended for summer operation.

While crankcase oil specifications remain practically the same for 1938, Chevrolet has altered somewhat the drain period recommendation. Where last year the proper time to change oil was left largely in the hands of the car owner, the 1938 recommendation states that, under normal driving conditions, oil should be drained every 2000 to 3000 miles. It is also pointed out that, under adverse driving conditions, it may become necessary to drain the oil more frequently.

When the lowest anticipated temperature is expected to be not under 32 degrees F., a 20-W or SAE 20 oil is recommended for the crankcase, with the added suggestion that 20-W, rather than SAE 20, be used if it is anticipated that the temperature will drop to freezing. As low as 10 degrees, a 20-W oil is recommended; as low as minus 10 degrees, 10-W; and below minus 10 degrees, 10-W plus 10 per cent kerosine.

It is pointed out that if SAE 20 or 20-W oil is not available, SAE 30 oil may be used if it is expected that the average prevailing daylight temperature will be consistently above 90 degrees F. Last year this temperature limit was set at 80 degrees.

LUBRICATION of the water pump continues the same as last year. The oil reservoir should be filled to the overflow hole with 20-W or SAE 20 engine oil. The reservoir holds one-tenth of a pint of oil. Lubrication is recommended every 1000 miles.

The countershaft of the carburetor accelerating pump is to be lubricated at least once every 5000 miles, as last year. This service is done by removing the screw attaching the dust cover and filling the threaded hole with graphite grease.

The starter and generator follow last year's recommendations, requiring an engine oil every 1000 miles. The distributor, also a 1000-mile point, is fitted with a grease cup to take a soft cup grease.

As was the case last year, the universal joint on the 1938 Chevrolet is directly connected to and receives its lubrication from the transmission. Similarly the rear wheel bearings receive their lubrication from the rear axle, making additional lubrication of the bearings unnecessary.

On the Master model with conventional springing, the spring bolts are located at the front of the front springs, and shackles at the rear of the front springs. As last year, rubber bushings are used at the front of each rear spring. New this year, as previously mentioned in this article, are the rubber bushings on the rear spring seats which eliminate lubrication points which were formerly on these spring saddles.

The steering mechanism on both models, and also the knee action units on the DeLuxe model, are equipped with pressure gun fittings in positions similar to those found on the 1937 Chevrolet.

The front spindle bushing should be

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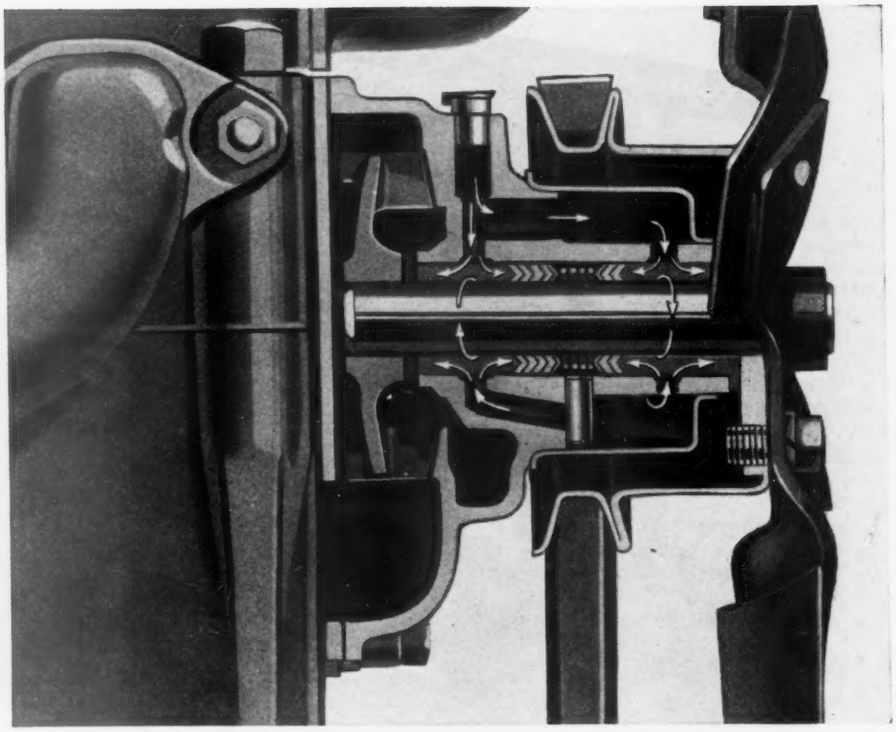
lubricated every 2000 miles. This requires removing the plug at the inner end of the spindle and packing the reservoir with a lubricant, such as soft cup grease, vaseline, or petrolatum. Passages from this reservoir carry the lubricant through the spindle to the bearing surface. The slotted pipe plug is installed at this point to prevent over-lubrication, generally brought about by the use of a pressure gun. Over-lubrication results in grease working out into the brake drum and linings.

The rear springs on the Master De-Luxe model are enclosed in metal covers, the leaves being coated and the covers filled with a special graphite grease at the time of assembly. In case it is found necessary to lubricate the leaves or refill the spring covers, it is recommended that a soft, smooth, cup grease be used to which 8 to 10 per cent graphite has been added.

There have been slight changes in capacities in the 1938 Chevrolets. The hypoid rear axle, which formerly had a lubricant capacity of 3⅛ pints, now holds 3 pints. The cooling system, formerly 13 quarts, now has a capacity of 14 quarts. All other capacities remain the same as those on the 1937 model—the grease crankcase being 5 quarts, the transmission 1½ pints, and the gasoline tank 14 gallons.



Fan and water pump assembly on the 1938 Chevrolet. The oil reservoir should be filled to the overflow hole with a 20-W or SAE 20 engine oil. The oil reservoir holds one-tenth of a pint

• • •

Chrysler and DeSoto . . .

Lubrication Servicing Identical On DeSoto And Chrysler Royal; All Models Have Hypoids; Oil Drain Periods Widened

DROPPING its Airflow design, the Chrysler line for 1938 includes the six cylinder Chrysler Royal, the eight cylinder Chrysler Imperial, and the Custom Imperial.

The 1938 DeSoto, which has many engineering features in common with the Chrysler Royal, is identical to it in lubrication servicing requirements and capacities.

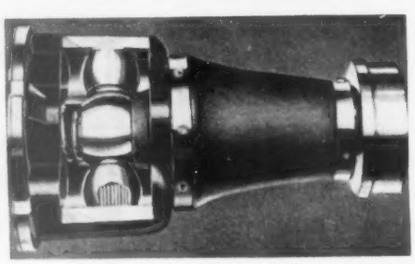
The transmission overdrive is standard equipment on the Chrysler Custom Imperial, and optional on all other Chryslers and DeSoto.

The hoods on all Chryslers and De Soto have discontinued the alligator-type construction used last year, and now use a type in which the horizontal hood sections on either side open up. The vertical side panels of the hood are bolted in place, but may be removed when necessary.

All models, including the DeSoto, are equipped with oil filters. The oil filter pack should be replaced every 8000 miles.

Improvements have been made in the independent front wheel suspensions. Upper control arms have been made more rigid, and all joints where there are moving parts, have been sealed to keep out dirt and water, and to hold oil in the bearings. Hardened steel threaded bushings have been placed in the upper control arms.

From a lubrication standpoint, probably the most outstanding change over last year is in the matter of oil change periods. Where last year the crankcase drain period was recommended for every 1500 miles in summer and every 1000 miles in winter, the new recommendations call for a drain (under normal driving conditions) every 2500 to 3000 miles in summer, and every 1500 to 2000 miles in winter.



Roller bearing universal joints are used in all 1938 Chrysler and DeSoto models. They are lubricated upon leaving the factory, and require no further attention for 30,000 to 40,000 miles of normal driving

SUGGESTIONS for determining the proper grade of crankcase oil to use at various temperatures have been simplified somewhat. During the summer, when the lowest anticipated temperature is 70 degrees and the average during the day is about 90 degrees, an SAE 40 oil is recommended, and when the lowest anticipated temperature is 32 degrees, an SAE 30 is specified.

On the basis of lowest anticipated temperatures, the winter crankcase oil recommendations are as follows: 10 degrees, use 20-W; minus 10 degrees, use 10-W; and minus 25 degrees, use 10-W plus 10 per cent kerosine.

In the conventional transmission and steering gear, an SAE 160 or 140 is recommended for summer, and an SAE 90 for winter. The SAE 140 recommendation is new for 1938.

The universal joints are lubricated when the cars leave the factory, and will not require any lubrication atten-

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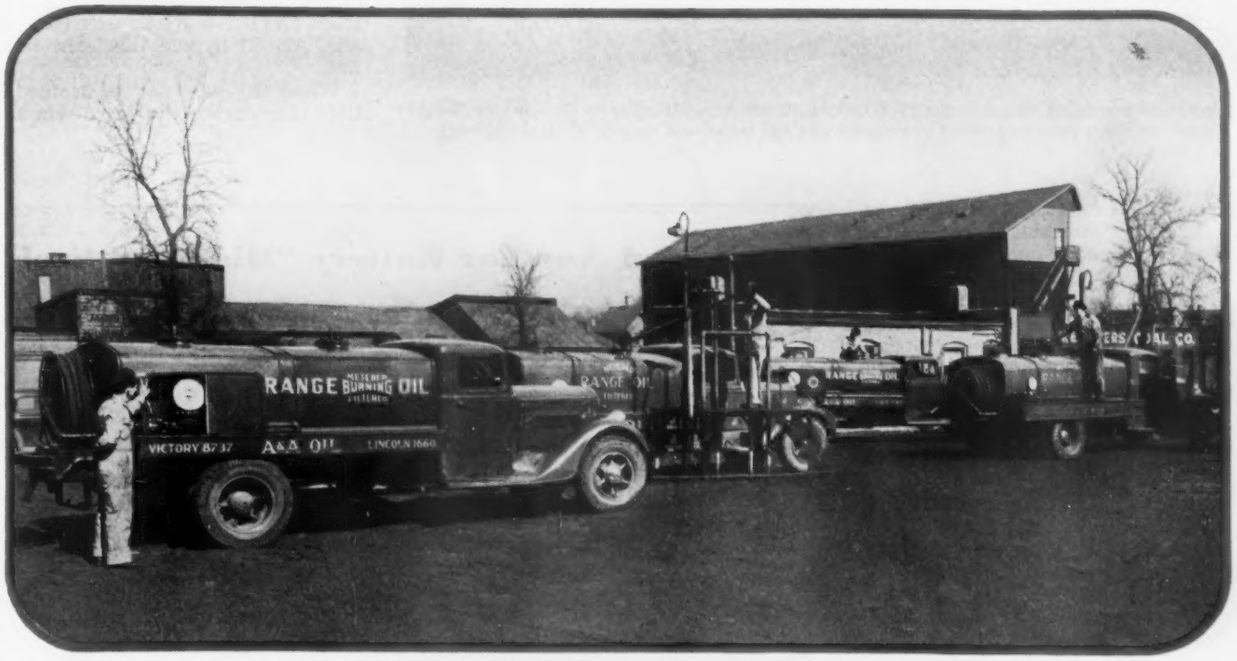

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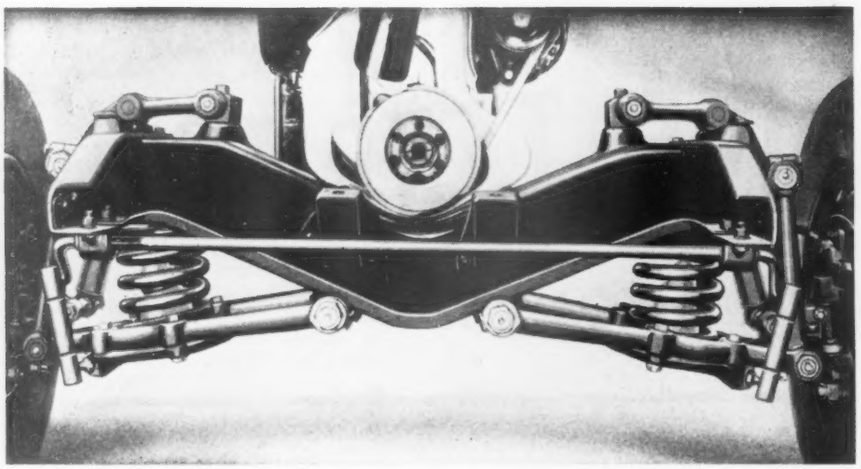


The front end suspension design of the 1938 DeSoto, shown here, is similar to the Chrysler Royal. All moving joints have been sealed to keep out dirt and water, and to keep oil in the bearings

tion for 30,000 or 40,000 miles of normal driving. However, the splined joint on the forward end of the Chrysler Imperial and Custom Imperial propeller shafts have a pressure fitting which takes a chassis lubricant every 2000 miles. This point does not appear on the Chrysler Royal or DeSoto.

On all models with the exception of the Custom Imperial, the seven passenger sedans have a propeller shaft center bearing which should be lubricated every 6000 miles with an SAE 30 engine oil in summer and a 20-W oil in winter. An oil cup is provided.

The water pump on the Chrysler Imperial and Custom Imperial requires no lubrication, but on the Royal and the DeSoto it takes a water pump grease every 2000 miles. The generator, with 2 oil cups, is now a 6000-mile point, instead of 2000 miles, as formerly.

While the clutch release bearing on all models requires no lubrication attention, the Custom Imperial has a clutch release fork bearing with a fitting on each side of the clutch housing which takes a chassis lubricant every 6000 miles.

In connection with the power brake cylinder on the Custom Imperial, the vacuum line at the rear should be removed every 6000 miles and one ounce of shock absorber, ice machine or transformer oil inserted.

The overdrive transmission, which is optional on all DeSoto and Chrysler models except the Custom Imperial, where it is standard, retains the same lubricant recommendations as last year. Seasonal changes are specified, with an SAE 70 engine oil being recommended for summer, an SAE 50 with a low cold test maximum of 10 degrees F., down to zero, and for temperatures consistently below zero, 90 per cent SAE 50 with low cold test plus 10 per cent kerosine.

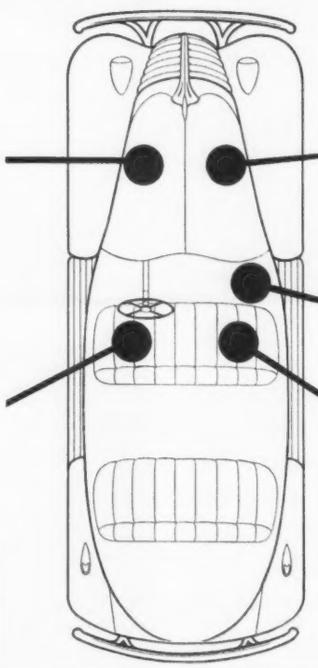
Following last year's design, the transmission case and overdrive case each have a drain plug. These cases should be drained, flushed and refilled every 6000 miles. With the exception of the Custom Imperial, there is only one hole (located in the transmission case) for the filling operation. The attendant is cautioned that the oil will flow slowly from the transmission case into the overdrive case, and sufficient time should be allowed to make sure that the lubricant level is the same in both gear cases.

A hypoid rear axle is used in all models. Where the drain period was formerly set at 6000 miles, it is now every 10,000 miles. In summer and normal winter use, an SAE 90 hypoid gear lubricant is recommended, and where temperatures average zero degrees and below for an extended period, an SAE 80 hypoid lubricant is specified.

When the lubricant is drained from the rear axle, the case should be

No Need Now for Battery "Hide and Seek"

Here's Where They Are On The '38 Models



Left Engine Compartment

Graham
Hudson
Hudson-Terraplane
Oldsmobile
Pontiac

Left Seat

Chrysler
De Soto
Dodge
Hupmobile
Nash-Lafayette
Packard
Pierce Arrow
Plymouth
Studebaker

Right Engine Compartment

Buick
★Cadillac V-8
Ford
★LaSalle
Lincoln Zephyr
Willys

Right Floor-Boards

American Bantam
Chevrolet
Lincoln

Right Seat

Nash
Cadillac V-16

Always make the hydrometer test **BEFORE** adding water.

★Remove batteries from under right front fender.

Alphabetical Listing of Battery Locations 1938 Models

Car	Location	
American Bantam	Floor Boards	Right
Buick	Engine Compartment	Right
★Cadillac V-8	Engine Compartment	Right
Cadillac V-16	Front Seat	Right
Chevrolet	Floor Boards	Right
Chrysler	Front Seat	Left
De Soto	Front Seat	Left
Dodge	Front Seat	Left
Ford	Engine Compartment	Right
Graham	Engine Compartment	Left
Hudson	Engine Compartment	Left
Hudson-Terraplane	Engine Compartment	Left
Hupmobile	Front Seat	Left
★LaSalle	Engine Compartment	Right
Lincoln	Floor Boards	Right
Lincoln Zephyr	Engine Compartment	Right
Nash	Front Seat	Right
Nash-Lafayette	Front Seat	Left
Oldsmobile	Engine Compartment	Left
Packard	Front Seat	Left
Pierce Arrow	Front Seat	Left
Plymouth	Front Seat	Left
Pontiac	Engine Compartment	Left
Studebaker	Front Seat	Left
Willys	Engine Compartment	Right

This chart, developed by Exide, shows the locations of batteries on the 1938 cars

flushed out with a flushing oil (not kerosine). Flushing oil should be completely removed before filling the case with fresh lubricant.

It is recommended that, should the level of the lubricant drop in the rear axle, the lubricant should be drained, the case flushed, and new lubricant added. Chrysler emphasizes that one brand of powerful extreme pressure lubricant should never be mixed with another brand.

With the exception of the Chrysler Imperial and Custom Imperial, all capacities remain the same as last year. On the Imperial, the capacity of the conventional transmission is now 3¼, instead of 2¼ pints, and the transmission with overdrive now takes 4½, instead of 3¼ pints.

The cooling system capacity of the Imperial, formerly 22 quarts, is now 20 quarts, while on the Custom Imperial it is also 20 quarts, reduced from a former 21.

Ford . . .

ADVERTISING PAGES REMOVED

Offers Two Lines Of Cars; No Changes Made Over 1937 In Lubrication Servicing

FORD for 1938 includes two lines of cars—the standard and the deluxe models. The standard models are available with either an 85 or 60 horsepower V-8 engine, while the deluxe is powered only with the 85-horsepower engine. Both lines of cars have the same chassis.

There are no changes over the 1937 Fords in the matter of lubrication procedure. Capacities for the two 1938 models follow the 60 and 85-horsepower models of last year. In the fall of 1937 Ford altered its engine oil recommendations, which now read as follows:

Average daytime temp. above 90 degrees .....SAE 40
Minimum anticipated temp. of 32 degrees .....SAE 30
Minimum anticipated temp. of plus 10 degrees...SAE 20 or 20-W
Minimum anticipated temp. of minus 10 deg. 10-W
Lower temp. .....
.....10-W plus 10% kerosine

• • •

Graham . . .

Hypoid Rear Axle Adopted; Summer Oil Change Period Increased To 2000 Miles; Vacuumatic Gear Shift Is Optional.

PARTICULARLY new on the 1938 Graham, aside from its entirely redesigned exterior, are the optional vacuumatic gear shift, similar to the type used on Studebaker and Nash, and the adoption of hypoid rear axles.

Graham has standardized on a single chassis, with a wheelbase of 120 inches, and one engine (with and without supercharger). The Graham Special has a 90-horsepower engine, the Supercharger has 116 horsepower, and the Custom Supercharger, with the same engine, is equipped with numerous accessories which are optional on the other models.

Instead of a single venturi tube, Graham's new carburetor employs a triple venturi, providing more positive suction and greatly reducing the lag which occurs when the ordinary carburetor is suddenly opened wide from the idling speed.

Among other changes found in the engine are an improvement in the cooling system whereby water going to the valve seats is sprayed from a tube directly to the required spot; a dual exhaust manifold; an eight-inch larger crankshaft, now 2⅜ inches; and a larger clutch.

The aluminum cylinder head is clamped firmly to the cylinder block by 33 studs, 13 more than last year. The high compression ratio of 6.7 to 1 remains unchanged from last year.

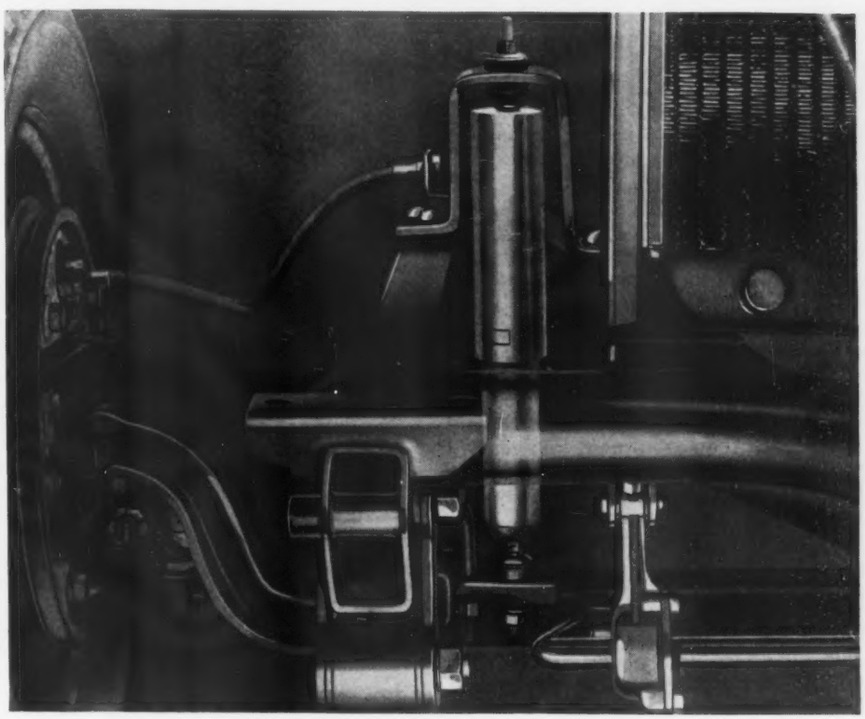
Explaining the supercharger, E. R. Harrell, Graham's vice president in charge of engineering, points out:

"The added power (26 horsepower) which a supercharger provides is largely the result of force-feeding a highly efficient mixture evenly into all cylinders, whereas the unsupercharged engine must depend upon the sucking action of the pistons to pull a less efficient mixture into them. Compression pressure reaches 217 pounds per square inch at 3000 r.p.m. in the supercharged engine, as against 165 pounds per square inch at 2000 r.p.m. in the unsupercharged engine."

The Graham hood for 1938 is of the lift top, or alligator, type. The battery is located under the hood.

New this year is an oil filter of the type used by Studebaker and Lincoln-Zephyr.

The vacuumatic gear shift lever is



A closeup of the 1938 Graham telescoping hydraulic shock absorber, tubular front cross member, rubber mounted spring shackles, and 11-inch cast iron brake drum with hydraulic connection

located at the center of the instrument panel, off the floor. The same clutch action and shift lever movement is employed as in the conventional shift lever, except that the shifting effort is assisted by a vacuum booster. This type of shift also includes a mechanical linkage to the transmission to make possible a shift when the engine is not running.

From a lubrication standpoint, all 1938 Graham models have the same requirements. Probably the most important change over last year is the adoption of the hypoid axle. An SAE 90 hypoid gear lubricant is recommended for summer and also for winter down to zero degrees F. Below zero, an SAE 80 hypoid lubricant is recommended.

The rear axle should be drained, cleaned with flushing oil, and refilled every 6000 miles. Graham cautions against adding lubricant between filling periods. In event the level becomes low, the balance should be drained out, and the housing flushed out and refilled. This is a protective measure against the mixing of two hypoid lubricants of varying properties.

The front and rear universal joints should be disassembled and inspected every 20,000 miles and repacked with universal joint grease.

The steering gear should be checked every 2000 miles and, when necessary, there should be added a special steering gear lubricant which has been approved by the Ross Gear and Tool Co.

With the adoption of the oil filter, Graham now recommends an oil change every 2000 miles during the summer, where formerly 1000 miles was the period recommended. The winter drain interval of 500 miles remains unchanged.

There has been no change in the grades of oil recommended for the crankcase. For summer, an SAE 40 is to be used; in spring and fall, an SAE 30; for winter down to zero degrees, 20-W; and below zero, 10-W.

The conventional transmission continues to take an SAE 160 gear lubricant for summer, and an SAE 90 for winter. Below zero degrees, an SAE 80 is specified, which was formerly an SAE 70. Draining and refilling are recommended every 6000 miles.

For 1938, Graham states that a mild extreme pressure gear lubricant may be used in the conventional transmission if desired, but that a hypoid gear lubricant must not be used.

With the overdrive transmission, also a 6000-mile point, an SAE 70 engine oil is again specified for summer and an SAE 50 for winter. Extreme pressure lubricants must not be used in the overdrive transmission, it is cautioned.

The fan, water pump and clutch release bearing require no lubrication on the 1938 Graham. For next year these models again turn to the use of fittings at the rear wheel bearing points, where a wheel bearing grease is recommended.

The clutch release shaft now has two fittings for a chassis lubricant, and a new point is the clutch pedal shaft, which takes a chassis lubricant. The tie rod, drag link and front axle spindle bolts all take a chassis lubricant as last year. Shackles are again rubber bushed, eliminating the need for lubrication at these points.

Following are the 1938 Graham capacities, which have undergone some general revisions, due to the reduction in a number of models:

Crankcase, 5 quarts; conventional transmission, 3 pints; overdrive transmission, 3 pints; rear axle, 3 pints; cooling system 15 quarts; and fuel tank, 16 gallons.

• • •

Hudson and Terraplane . . .

Optional "Electric Hand" Again Featured; Battery Under Hood

HUDSON and TERRAPLANE, again offering the "electric hand" shifting mechanism optionally on its 1938 models, is making much of the fact that it was the first to introduce an automatic transmission, a feature which several other car manufacturers are offering for the first time on new models.

The complete Hudson line includes an Eight, made on both 129 and 122-inch wheelbase; a Six on 122-inch wheelbase; and the Hudson Terraplane, on a 117-inch wheelbase.

Some improvements have been made in Hudson's selective automatic gear shift, making the transmission more completely automatic than previously. For example, if upon shifting with the electric hand an abutment of gears should ever exist in going into low or reverse speeds, the selective lever automatically returns to neutral.

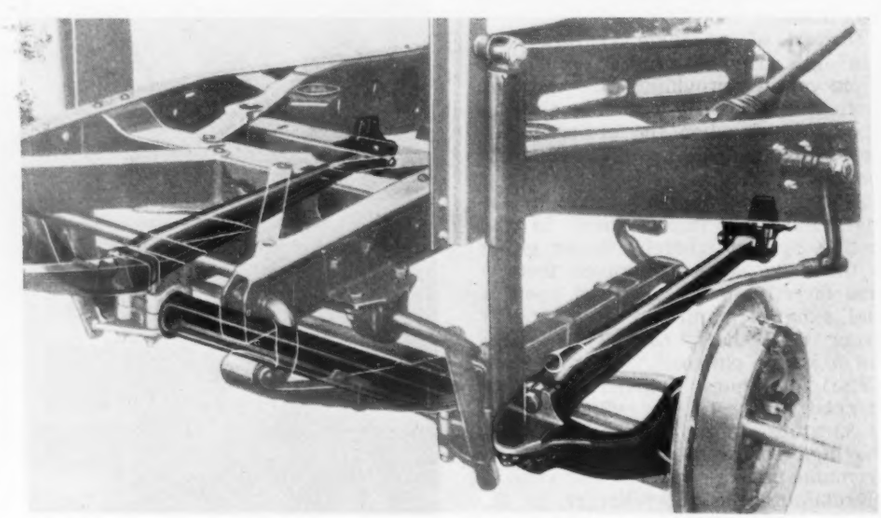
A minor change in the cooling system will be found in the use of a synthetic rubber and cork compound to seal the water pump. Also on the Hudson Eight additional cooling capacity is obtained by a redesigned core, with the frontal area of the radiator also increased.

The 1938 transmission has a larger filler opening for lubricating purposes, and, in connection with the transmission, the hill-holder device which was offered optionally in 1937, is continued.

The Hudson front radial control is continued with new forged steel torque arms which are said to be stronger and lighter than the previous construction. New oil seals are used at the spindles, made of synthetic rubber and cork compound, similar to those used on the water pump.

Hudson continues its practice of last season in placing the battery under the hood on all models. It is located under the left front fender and is easily accessible through the left side of the engine compartment. A hinged lid is provided in the cover directly over the cell caps.

With the exception of capacities, all



The torque arms used on the front end of the 1938 Hudson and Terraplane are similar in design to last year's, but are now made of forged steel and are lighter and stronger

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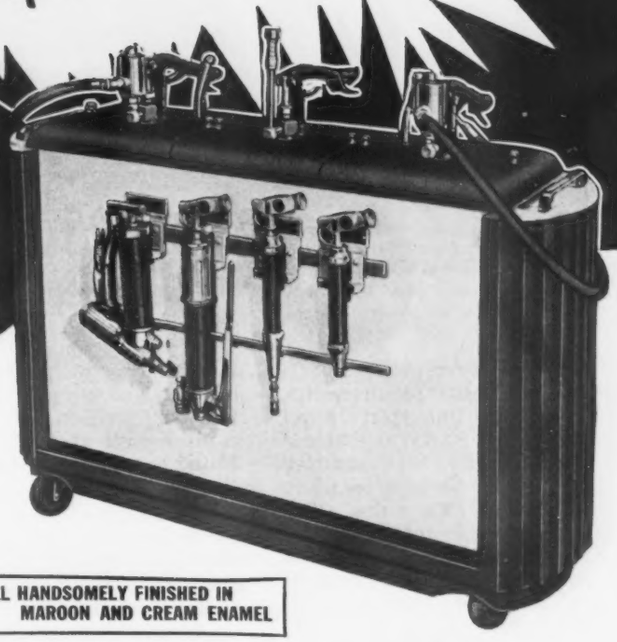

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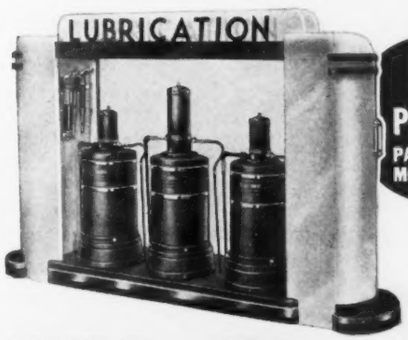

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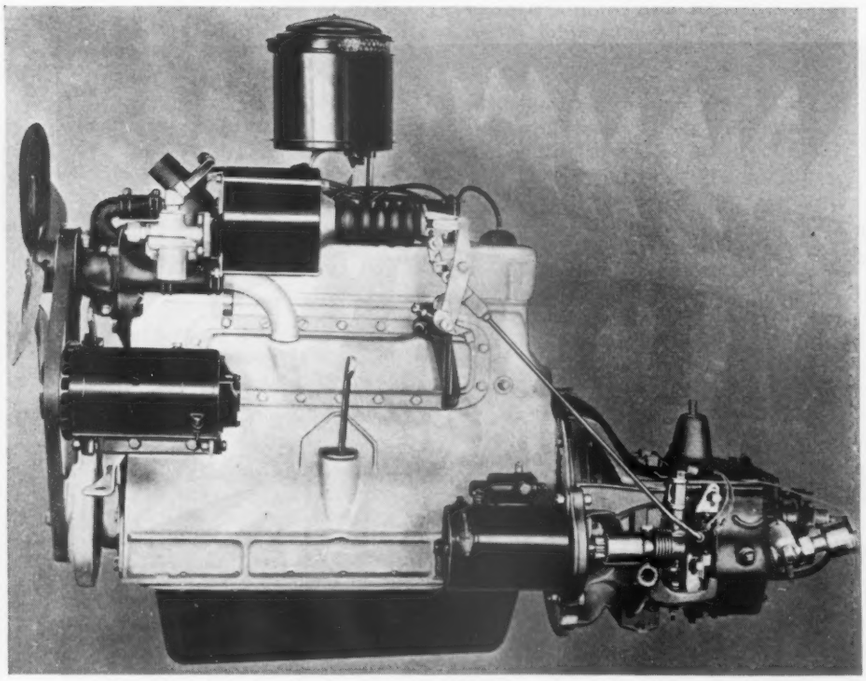

The 1938 Hudson Six engine, equipped with the automatic clutch control. This device is located just to the left and on a level to the top of the cylinder block. When combined with Electric Hand it is merely necessary to select the desired gear with the finger-tip lever, and by releasing the accelerator pedal the actual movement of gears is accomplished

1938 Hudson and Terraplane models have identical lubrication requirements.

The rear axle, of the spiral bevel type, now takes an SAE 110 extreme pressure lubricant for both summer and winter. Changes are to be made seasonally or every 5000 miles. The same lubricant recommendation is made for the steering gear on the 1938 models. These points formerly took an SAE 160 e.p. for summer and an SAE 90 e.p. for winter.

The brake and clutch pedal bearings now have a fitting which requires a chassis lubricant every 1000 miles. This point was formerly serviced with engine oil.

A new point this year is found on the automatic clutch control governor adapter, and is optional equipment. It will be found on the left side of the transmission at the rear, and has a fitting to take a chassis lubricant every 1000 miles.

The automatic clutch control cylinder is equipped with a pipe plug which should be removed every 15,000 miles and one ounce of Hudson shock absorber fluid inserted.

Universal joints, equipped with needle roller bearings, should be disassembled, cleaned and repacked every 10,000 miles. The front universal joint spline shaft should be lubricated every 1000 miles with a chassis lubricant. A plug is used at this point, which should be removed and a lubricant fitting installed to do the servicing. The regular plug should be replaced after the job is done, and the attendant is cautioned against over-lubrication at this point to prevent damage to the oil seal.

As in the case of the rear axle and steering gear, the 1938 Hudson and Terraplane transmissions also take an extreme pressure lubricant, with an SAE 90 e.p. being recommended for summer, and an SAE 80 e.p. for winter.

An aluminum soap base lubricant is again recommended for the water pump every 1000 miles, and a pressure gun fitting is provided.

Crankcase oil recommendations remain the same as last year, with an oil drain being specified every 2000 miles. Where 50 degrees F. is the minimum atmospheric temperature expected, an SAE engine oil is recommended. Where 10 degrees is the lowest anticipated temperature, 20-W is specified; as low as minus 10 degrees, 10-W; and as low as minus 30 degrees, 10-W plus 10 per cent kerosine.

Front and rear shackle points of all springs, steering spindle pins, tie rod ends, spring seats on front springs, and the drag link, all take a chassis lubricant every 1000 miles. At the same time the distributor, starter and generator take an engine oil in cups provided for that purpose.

The clutch release bearing, also a 1000-mile point, is lubricated through a fitting located on the right side of the clutch bell housing. One ounce of chassis lubricant is recommended for each service period.

Rear axle capacity on all models remains at 2¾ pints, while that of the transmissions stays at 3 pints. The crankcase of the six cylinder models has a refill capacity of 5 quarts, and on the eights it remains at 7 quarts. Changes have been made in the cooling system capacity. Formerly 13 quarts on the Six models, it is now 12½; on the Eight it has been reduced 2½ quarts, to 17½.

• • •

Hupmobile . . .

Recommends Engine Oil For Transmission, With or Without Overdrive; Eight-Cylinder Model Equipped With Hypoid Axle

AFTER being inactive for over a year, Hupmobile returns to the 1938 scene with two cars, a six and an eight.

Both models are equipped with double action hydraulic brakes. An overdrive transmission is optional on both models, and a hypoid rear axle is employed on the eight only, the six having a spiral bevel type axle.

A one-piece alligator-type hood lifts from the front, and the hood side panels which cover the lamps are quickly detachable, affording access to lower parts of the engine.

While Hupmobile, in its service instructions to owners, asks that the Hupmobile dealer be consulted for the proper type of lubricants for rear axle and transmission, this company has no "approved list" of lubricants. Hupmobile's service department recommends an SAE 90 hypoid lubricant for the hypoid axle on the eight model, and either an SAE 90 hypoid or an SAE 90 e.p. for the spiral bevel axle on the six. These recommendations are for all seasons with draining, flushing and refilling to be done twice a year.

For the transmission, either with or without overdrive, lubricant recommendations are for an SAE 50 engine oil in winter and an SAE 70 in summer, with draining and refilling required twice a year. Hupmobile cautions that refined oils that are not corrosive are required in the trans-

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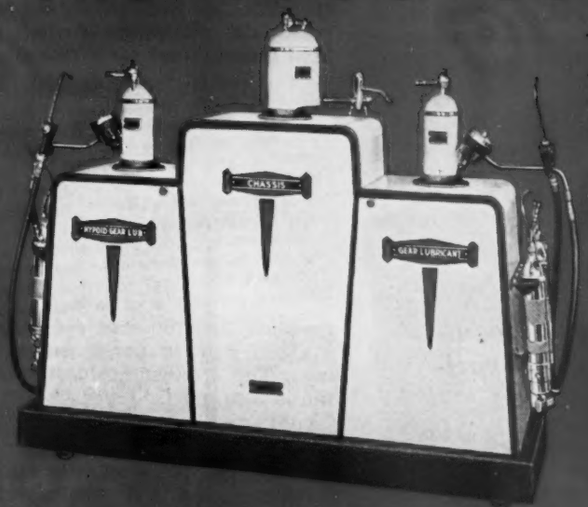

The Lincoln Streamliner, shown above, incorporates the famous Twin Cylinder Airline Lubrigun for chassis lubrication, and two Metered Gear Lubricant Dispensers, all air operated. Can be installed for either stationary or portable service. Cabinet accommodates three 100-lb. lubricant drums. Front panel is removed by unscrewing two thumbscrews.

TWO-UNIT Streamliner, shown above, is designed for use where one Twin Lubrigun for chassis and one Metered Gear Lubricant Dispenser will meet the immediate needs. Both are air operated. Cabinet holds two 100-lb. drums.

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Model 2678 Junior Streamliner, shown above, incorporates a Single Cylinder Air-Operated Lubrigun and two Hand-Operated Gear Lubricant Dispensers.

Model 2679 Junior Streamliner, shown at right, includes one Single Cylinder Air-Operated Lubrigun and one Hand-Operated Gear Lubricant Dispenser.

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missions equipped with overdrive, and that lubricants containing solid compounds or heavy compounded soaps must not be used.

Crankcase oil is recommended for draining every 1000 miles. During summer when the car is being driven at continual high speed or when the temperature is consistently above 90 degrees, an SAE 40 engine oil is recommended. Between 90 and 45 degrees in summer, an SAE 30 is to be used. In winter, between zero and 45 degrees, an SAE 20 is specified, and for temperatures of zero degrees and below, a 10-W is to be used.

All steering mechanism points, as well as shackles, road shock eliminator at the rear of the left front shackle, and clutch release shaft, take a chassis lubricant every 1000 miles.

The clutch pedal, clutch release connections, clutch pedal, ignition distributor bearing, starting motor, and generator, take an SAE 20 motor oil every 1000 miles. Front wheel bearings are to be repacked with a wheel bearing lubricant every 4000 miles.

The alligator-type hood, as shown here on the 1938 Hupmobile, is also used on Cadillac, Ford, Graham, LaSalle, Lincoln-Zephyr, Studebaker and Willys

It is recommended that the propeller shaft spline be filled every 1000 miles with a semi-fluid lubricant "such as used in the rear axle." The universal joint needle bearings and reservoir in the ends of the journal are packed with lubricant on assembly, and it is recommended that the joints be removed at 20,000 miles for cleaning, repacking, and installing of new seals.

Capacities for the six are as follows: crankcase, 6 quarts; transmission without overdrive, 2¼ pints; transmission with overdrive, 6 pints; rear axle, 2¾ pints; cooling system, 18 quarts; fuel tank, 16 gallons.

Capacities for the eight are as follows: crankcase, 8 quarts; transmission without overdrive, 3½ pints; transmission with overdrive, 7 pints; rear axle, 3½ pints; cooling system, 21½ quarts; fuel tank 16 gallons.

• • •

Lincoln-Zephyr . . .

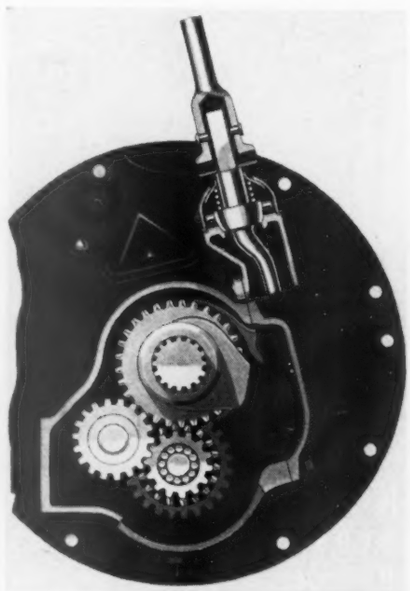
Hypoid Rear Axles Adopted; Oil Changes Recommended Every 5000 Miles; Two-Speed Axle Available at Extra Cost

LINCOLN-ZEPHYR offers a number of interesting lubrication developments for 1938, principal among which are the hypoid axle and the addition during 1937 production of an oil filter which now permits an oil drain recommendation of every 5000 miles. The filter was added starting in March, 1937, and is being continued with the additional recommendation that the cartridge be changed every 10,000 miles.

The hypoid rear axle, new this year, is to be drained, flushed and refilled twice a year or every 5000 miles with an SAE 90 hypoid lubricant during both summer and winter, except when temperatures go below —10 degrees, in which case an SAE 80 hypoid lubricant is recommended. A two-speed rear axle is available at extra cost, and follows the same lubricant recommendations.

The wheelbase of the Lincoln-Zephyr has been increased 3 inches, and is now 125 inches. The hypoid axle has reduced the floor tunnel in the rear compartment, while the obstruction in the front compartment has been reduced by redesigning the transmission and placing the shifting mechanism on the side instead of on the top. The engine and transmission unit have both been moved further forward. The gearshift lever is now carried upward ahead of the instrument panel where it comes through the vertical section of the panel and then backward to a convenient position.

On the engine, the valve lifters are of the self-adjusting silent type, operated from the lubrication system, as on the large Lincolns. The shape of the combustion chambers has been modified for smoother operation, with a slight gain in power output resulting. The crankshaft location for the fan is continued.



The redesigned Lincoln-Zephyr transmission places the shifting mechanism on the side instead of the top

Other mechanical changes include the use of angle-mounted rear spring shackles, in place of the transverse stabilizing rod and vertical shackles used in 1937.

The battery on the 1938 Lincoln-Zephyr is located under the hood.

A NUMBER of lubrication changes were made during production of the 1937 car, and are continued on the 1938 model. Included among these are the following: A fitting is provided just to the rear of the universal joint for lubricating the propeller shaft front bearing, and takes a chassis lubricant every 1000 miles; the brake cross shaft bearing, requiring no lubrication on early 1937 models, now is supplied with fittings at each end of the shaft, and takes a chassis lubricant every 1000 miles.

The front and rear strut rods, or ride stabilizers, which formerly had pressure gun fittings at each end, are now equipped with oilless type bushings and require no lubrication. On the front stabilizer, this change was made during 1937 production.

Engine oil recommendations show a tendency toward the use of lighter grades, as follows:

Above 90 degrees F.....SAE 40
Above 32 degrees .....SAE 30
Above 10 degrees..SAE 20 or 20-W
Above 10 degrees 10-W
Lower temperatures .....
....10-W plus 10 per cent kerosine

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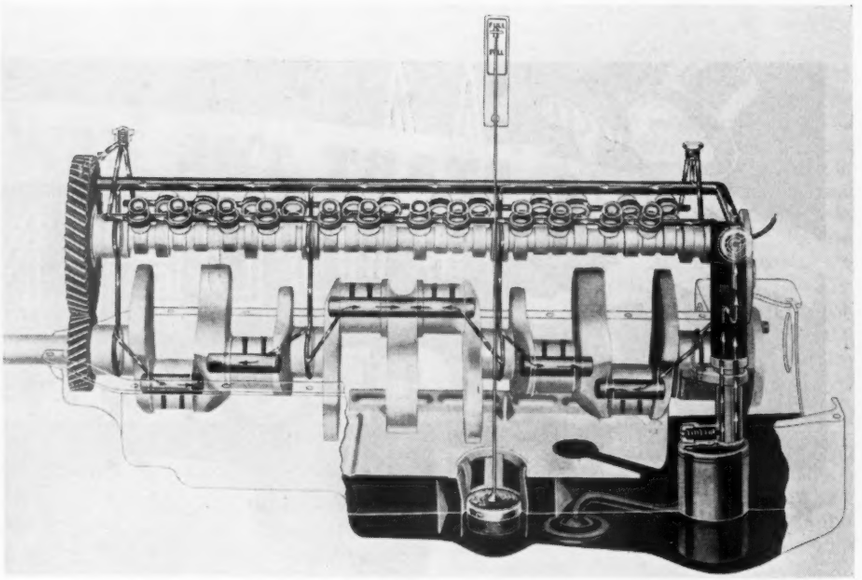
The temperature range formerly started with an SAE 50 grade for temperatures above 90 degrees.

The transmission lubricant recommendation remains the same as last year, with an SAE 90 or 110 gear lubricant required for winter, and an SAE 160 for summer.

Draining and refilling the crankcase, transmission and rear axle, repacking the front wheel bearings, and cleaning the fuel pump screen are to be done each spring and fall, or every 5000 miles, whichever occurs first. All other points are to be serviced every 1000 miles.

Some changes in capacities are to be noted. The rear axle, formerly taking 2½ pints, now has a capacity of 4 pints. The two-speed axle takes 4½ pints. The crankcase, formerly holding 6 quarts, now takes 5 quarts. The cooling system capacity has been increased to 30 quarts, 3 more than last year. The transmission capacity remains at 2½ pints, and the fuel tank at 19 gallons.



The 1938 Zephyr's new oiling system which includes feeder lines for the new hydraulic valve lifters

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Nash and LaFayette . . .

Offers Vacuum-Operated Gear Shift; Recommends Engine Oil In All Transmissions; Specifies Factory-Approved E.P. Lubes For Rear Axle

NASH for 1938 offers the Nash Ambassador Eight, the Ambassador Six, and the Nash-LaFayette Six.

Features of the Nash line are the winter air conditioning system, and the vacuum operated gear shift, both optional on all models.

The air conditioner consists of a unit containing an air filter, a motor driven fan, and a hot water heating element. A stack arrangement in the cowl ventilator spins the moisture out of the air as it enters through the the ventilator, then forcing it through the filter, the fan, and finally through the heating element.

The vacuum gear shift is similar in design to those used on Graham and Studebaker. The control handle is mounted on the instrument panel and operates a booster vacuum cylinder which assists in the shifting operation. Movement of the lever and the clutch operation are the same as in the conventional shift operation.

On the Nash line, the operation of the vacuum shift depends entirely on the vacuum created by the operation of the engine, so that shifting can only be accomplished when the engine is running. If for any reason it is found necessary to start the engine by placing the car in high gear and having it pushed, the operator must raise the hood on the right side of the car. There he will find a rod connecting the lever on the transmission case and the vacuum control cylinder on the side of the engine. Pushing this rod to the rear will place the car in high gear.

The automatic overdrive, which was optional on all Nash cars last year, continues on the same basis for 1938.

An automatic hill-locking device, which Nash has dubbed "NoRol", has been added as an optional feature. It prevents a car from coasting backwards on a hill.

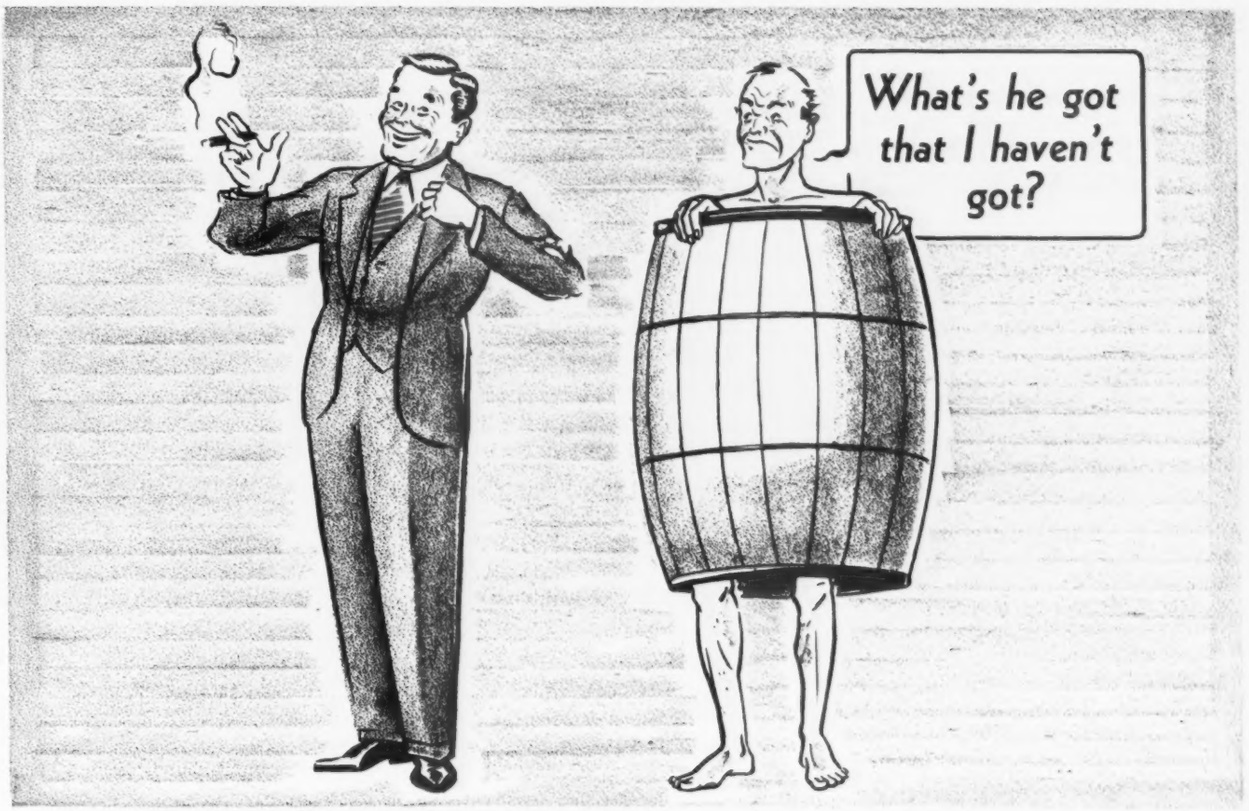
This is the winter air conditioning unit, offered optionally on all 1938 Nash cars. It is installed beneath the cowl, uses the cowl ventilator as an intake, and purifies, warms and circulates the air in the car

One of the principle changes in the lubrication of the new Nash cars is in the conventional transmission. For some years Nash has recommended using the same lubricant in both the transmission and differential. However, on the 1938 line the conventional transmission, as well as the overdrive transmission, takes an SAE 70 engine oil for summer and an SAE 50 for winter. In both types of transmissions the oil is to be changed every 5000 miles.

IN THE overdrive transmission both cases have their own fill and drain plugs.

In the lubrication of the rear axle, also a 5000-mile point, Nash continues its recommendation of a Nash-approved SAE 90 extreme pressure lubricant (not hypoid). The company cautions against the use of a hypoid lubricant or other unapproved lubricants in its rear axle, which is of the spiral bevel type. The attendant is urged to check the level every 1000 miles, and to use the same type and grade of lubricant at all times.

It is recommended that the crankcase oil be drained every 1000 to 1500 miles depending upon the severity of the driving conditions. During the production of 1937 Nash cars, the company discontinued the SAE 40 engine oil recommendation. New specifications include: an SAE 30 for hot weather with a minimum of 80 degrees F.; an SAE 20 for general spring, summer, and fall driving, between 80 and a low of 40 degrees; 10-W for normal win-



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ter driving between minus 10 and 40 degrees; and a 10-W plus 10 per cent kerosine for lower temperatures than minus 10 degrees. A float gauge is provided on the left side of the Ambassador Eight engine to be read when the engine is running.

A water pump lubricant is required for the water pump every 2000 miles. This was formerly a 1000-mile point. The lubricant should be used sparingly.

Engine oil should be used in lubricating the fan. The oil circulating pump which is built into the fan will not circulate an oil which is less fluid than motor oil. The filler plug must be removed for this operation. Formerly a 2000-mile point, the fan is now to be lubricated every 1000 miles.

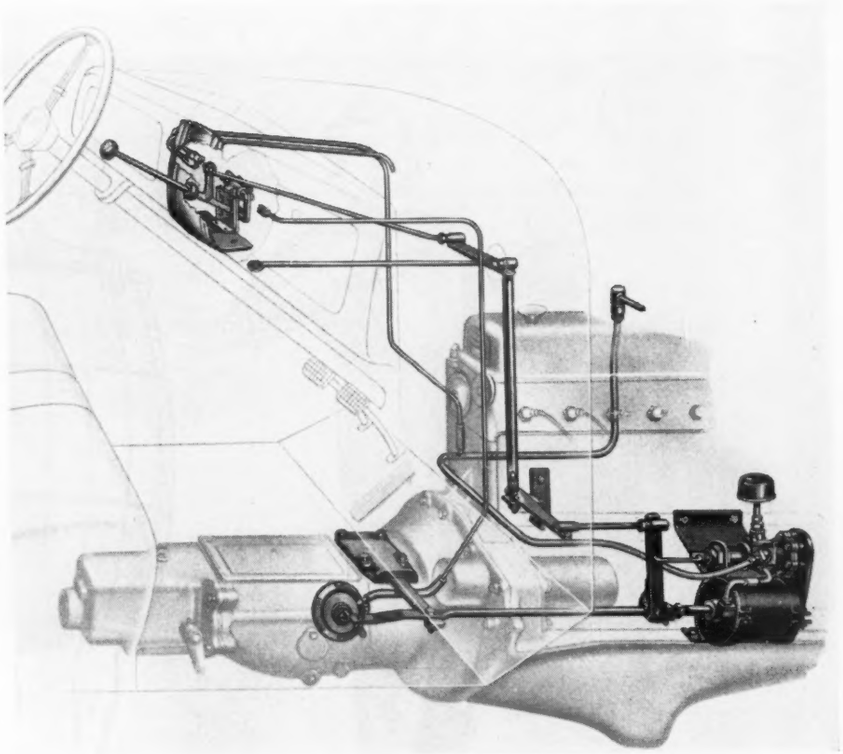
Generator, distributor and starter are to be lubricated every 1000 miles with a few drops of engine oil.

Both front and rear wheel bearings should be repacked with wheel bearing lubricant every 5000 miles. The attendant is warned against the use of an incorrect lubricant at these points as it may result in a portion being forced through the retainers to the brake linings.

The universal joints are of the needle bearing type and are packed with lubricant at the factory. They should be disassembled and lubricated with vaseline or a light cup grease every 12,000 miles. The spline shaft on the front joint should be lubricated with chassis lubricant every 3000 miles.

In lubricating the steering knuckles, it will be noted that at the upper bearings there are oil cups which take an engine oil every 1000 miles. The lower bearings require a chassis lubricant at the same interval. It is emphasized that a heavy grease should not be used at these points.

Each end of the tie rod and drag link have fittings for a chassis lubricant. These points formerly required a heavy oil.



A diagrammatic view of the 1938 Nash vacuum gear-shifting system, offered optionally on all models. The same shifting motions are used as in the conventional shift lever

Spring shackles are to be lubricated every 1000 miles with a chassis lubricant; formerly a heavy chassis oil was recommended. The points to be covered are the front ends of both front springs, the rear end of the right front spring, the rear ends of both rear springs, and the front ends of the rear springs. The latter were formerly rubber bushed, requiring no lubrication.

Nash continues the use of the steering shock eliminator, mounted on the rear of the left front spring. The two bolts at this point are to be lubricated every 1000 miles with a heavy chassis oil.

With the exception of the cooling system on the two Ambassador models, all capacities remain the same as last year. The cooling system on the Ambassador Eight has been decreased from 18 to 17 quarts. On the Ambassador Six it has been reduced from 17 to 16 quarts.

• • •

Oldsmobile . . .

Optional Automatic Transmission Uses Engine Oil; 2000 to 3000 Mile Drain Periods Specified

PROBABLY the most important development on the 1938 Oldsmobile is the new automatic transmission, now optional on both the Six and the Eight. This device was first introduced as optional equipment on the Eight only in the spring of 1937. It is similar in its design and operation to the unit offered on the Buick 40 for 1938.

An oil bath air cleaner, originally offered as optional equipment, is now standard on both cars.

Following the move of many other 1938 cars, Oldsmobile has located the battery in a new position under the hood beside the engine. Longer and narrower than before, the battery is now carried in a container which is air-cooled by a duct leading from the front of the engine compartment.

Station attendants who may find it necessary to know how to operate the automatic transmission when moving cars about the station, will find these simple pointers helpful.

When starting ahead, the clutch is depressed and the hand control moved to the first position. Releasing the clutch moves the car ahead in first gear. At about 10 miles per hour the transmission shifts automatically to second gear. Without using the clutch, the control lever can then be moved to second-forward range, at which time the car will shift automatically into third gear. At about 23 miles per hour the transmission automatically shifts into fourth gear. To stop, depress the clutch and move the control lever to the "off" position. In reversing, the car should be brought to a complete stop, the clutch thrown out, the button on the end of the control lever depressed and the lever moved to the "rev." position. The clutch is then operated in the conventional manner.

The rear springs on both models are packed with a permanent lubricant at the time of assembly and are sealed in metal covers.

Oldsmobile's copper radiator cores have a total area of 458 square inches. The leak-proof ball bearing water

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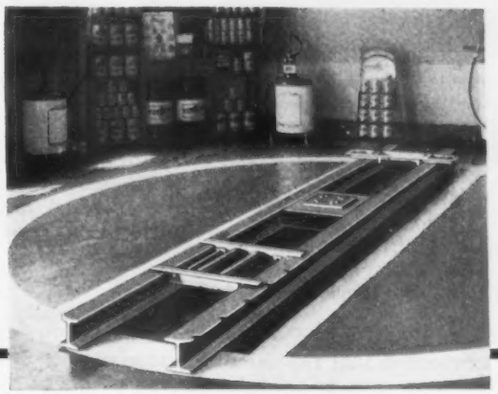

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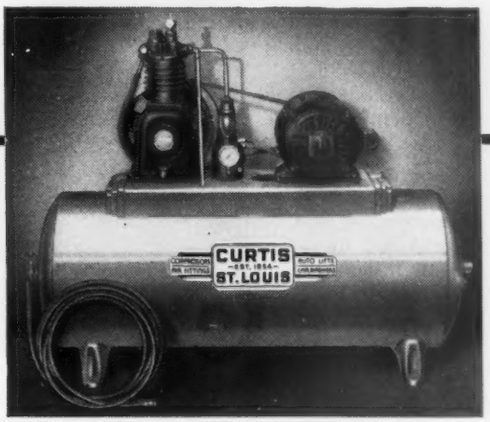

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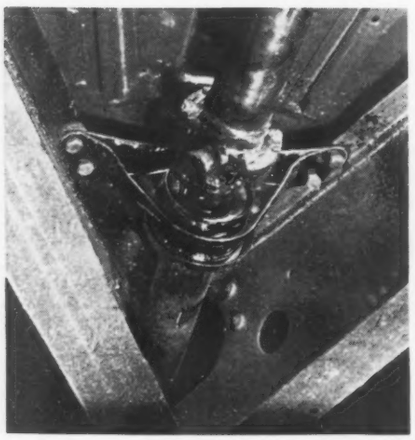


The center universal joint and shaft bearing on the 1938 Oldsmobile Eight. A two-piece drive shaft is employed to eliminate the rear compartment tunnel. (Photo copyright, Photo-Chek Service, Chicago)

pump is capable of circulating 55 gallons of water per minute. The bearings are permanently lubricated and sealed.

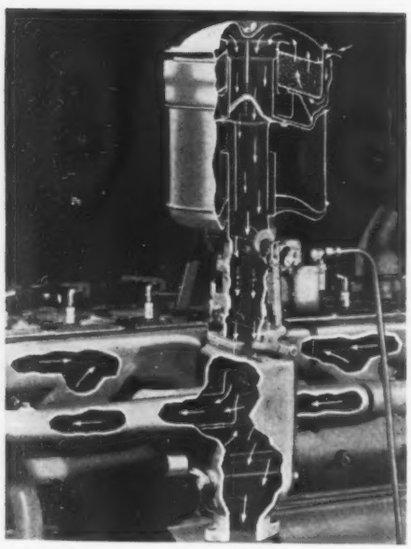
In servicing the automatic transmission, it is recommended that the same grade of oil be used that is used in the crankcase. The oil in this transmission should be changed every 10,000 miles except for the same seasonal changes as recommended for the crankcase oil. The oil level should be checked every 1000 miles. In checking the level, a plate found in the front compartment floor board must be removed. This operation will give access to a conventional type of dip-stick oil gauge. Oil must be kept at the "Full" mark on this gauge at all times. The oil filler opening is reached through this same floor opening. The capacity of the automatic transmission case is 3½ quarts.

In 1937, Oldsmobile recommended an oil change every 1000 miles "under ordinary driving conditions". The 1938 recommendation states that under normal driving conditions the crankcase oil should be changed every 2000 to 3000 miles, with the further stipulation that "under adverse driving conditions it may become necessary to drain the crankcase oil more frequently".

Oldsmobile recommends the following grades of oil to use for the various temperatures, during the fall, winter and spring:

If the anticipated minimum atmospheric temperature is . . .	Use the grade of oil indicated
Not lower than 32 degrees F.	20-W or SAE 20
As low as plus 10 degrees	20-W
As low as minus 10 degrees	10-W
Below minus 10 degrees	10-W plus 10% kerosine

For summer operation, an SAE 30 crankcase oil is recommended when the average daylight temperature is expected to reach 90 degrees or above.



The heavy duty oil bath air cleaner is now standard equipment on all 1938 Oldsmobile models. It has a capacity of one pint of SAE 50 engine oil, and should be cleaned and refilled every 5000 miles under normal conditions

OLDSMOBILE continues with its two-piece propeller shaft, used first in 1937 models. This design permits the rear compartment floor to be lowered about 3 inches without resorting to a hypoid axle. The needle bearings at the transmission and rear axle ends of the propeller shafts, and the ball bearing at the center connection of the propeller shaft are packed with lubricant at the time of their manufacture, so that no lubrication attention need be given these bearings. However, it is necessary that a chassis lubricant be applied every 1000 miles to the slip joint of the propeller shaft at the rear axle.

On both the Six and the Eight, the standard transmission takes an SAE 160 gear lubricant for summer and an SAE 80 for winter. This latter recommendation was formerly SAE 90.

Although the rear axle is of the spiral bevel type, it is pointed out that it must be drained and refilled every 10,000 miles or twice a year with an SAE 90 hypoid gear lubricant. For temperatures below minus 10 degrees, an SAE 80 hypoid lubricant is recommended.

The front end chassis points, including inner and outer tie rods, upper and lower control arm pivot pins, intermediate arm bushing, king pins, and drag link, are found in the same positions as last year and require a chassis lubricant every 1000 miles.

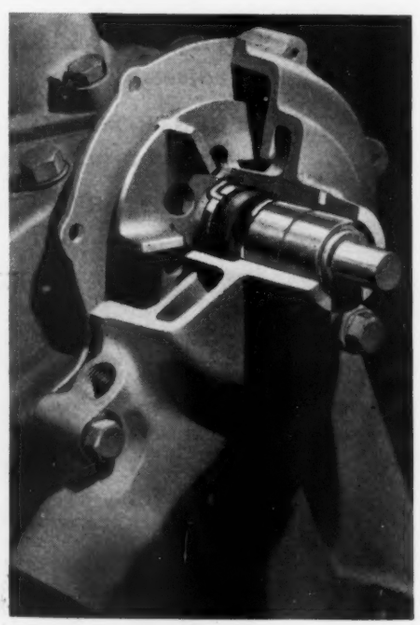
The steering gear is filled at the factory with an all-season lubricant, and it is recommended that the plug in the housing be removed and the case replenished with chassis lubricant every 5000 miles, if necessary. Rear spring shackles and spring bolts also take a chassis lubricant every 1000 miles, as formerly.

The heavy duty oil bath air cleaner is now standard equipment on both cars. It has a capacity of one pint and should be cleaned and the oil compartment replenished with an SAE 50 engine oil every 5000 miles. A more frequent cleaning and refilling is recommended where dusty conditions prevail.

The oil level in the Oldsmobile automatic transmission is measured by a dip-stick as shown in the photograph. The case is filled through the same hole, located under the front compartment floorboard. (Photo copyright, Photo-Chek Service, Chicago)

With the exception of the cooling systems, all capacities on both cars remain the same as last year. The cooling system of the Six is now 17 quarts instead of 16, and that of the Eight is 21 quarts instead of 20.

The capacity of the standard transmission remains at 2 pints, while the automatic transmission takes 3½ quarts. The rear axle capacity remains at 2½ pints on both cars, and the crankcase of the Six takes 6 quarts for refill, and the Eight takes 7 quarts. The gasoline tank capacity stays at 18 gallons.



Sectional view of the 1938 Oldsmobile water pump. The ball bearings are lubricated and permanently sealed at the factory and require no further attention

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Packard . . .

Recommends Twice-A-Year Chassis Lubrication, 2000 to 3000-Mile Oil Drain Periods; Oil Filter Standard on All Models; Continues with Hypoids

IF the oil industry has not yet observed the current advertising for the 1938 Packards, it will be interested in the following passage which is used as a sales point and featured as a reduction in service needs:

"Chassis lubrication is now needed, in normal usage, only twice a year". In other words, Packard for 1938 recommends chassis lubrication at 5000-mile intervals, instead of at 2000-mile periods as formerly.

There are also other things about the new Packards that will interest the oil industry. Cylinder block water jackets have been extended practically the full length of the cylinders to provide a cooler running engine, and oil filters, formerly standard on only the two large Packards, are now regular equipment on all 1938 Packards.

These changes have given Packard engineers courage to recommend crankcase oil changes every 2000 to 3000 miles instead of the former 2000 miles. These new change periods are recommended "as the most closely approximating average conditions". The company does, however, caution the owner that good lubrication is low priced insurance against high maintenance costs.

The rear spring on the 1938 Packard Six and Eight. Static friction is greatly reduced by means of cup-like depressions at the ends of the leaves. These contain buttons, some of which are oil-impregnated bronze and some rubber. The shackles on these two models are rubber bushed

Packard again in 1938 uses hypoid rear axles, recommending a once-a-year change of lubricants and advising the owner to see his Packard dealer for an approved lubricant.

Packard again offers four cars for 1938 — the Six, the Eight, the Super Eight, and the Twelve. The Eight takes the place of last year's "120" model.

The rear springs of the Six and Eight are of a new design which is designed to eliminate static friction. At the outer ends of the spring leaves there are cup depressions which contain buttons, some of which are rubber and some of oil-impregnated bronze. The forward ends of the springs are mounted in rubber and the spring shackles are rubber bushed, eliminating shackle lubrication on these two models.

THE Packard Safe-T-flex independent front wheel suspension system continues on all models, with no lubrication changes, except that points are to be lubricated at 5000 instead of 2000-mile intervals.

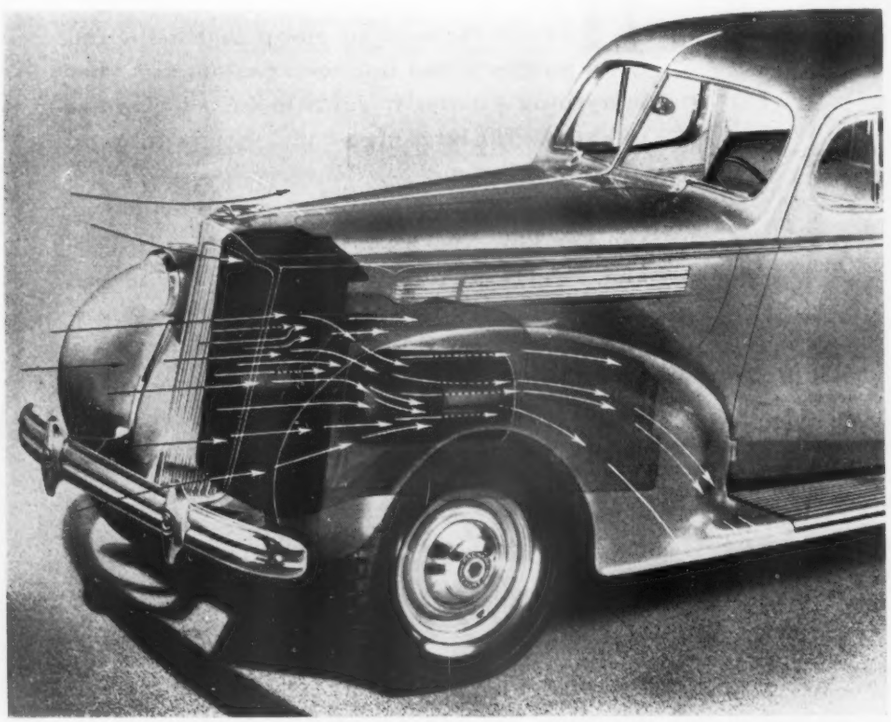
The Twelve, as before, has oil operated automatic valve adjustments. In the Six and Eight there are new mushroom type valve tappets with full pressure lubrication.

The oil filter, now standard on all models, is a by-pass, two-stage type and is attached to the left side of the engine near the front. Packard engineers urge that the filter cartridge be replaced every 8000 miles, and that in no case should it be used beyond 10,000 miles.

Engine oil temperature brackets have been altered somewhat. New specifications list the lowest temperature to be encountered at which a certain viscosity oil is to be used. The new recommendations for engine oil are as follows:

Below minus 10 degrees F.....
.....10W plus 10% kerosine
Minus 10 degrees F.....10W
Plus 10 degrees 20W
Plus 32 degrees .....SAE 30
Plus 90 deg. (avg. daylight temp.) SAE 40

As previously stated, with the exception of engine oil changes, no lubrication point requires attention at less than 5000-mile intervals. In addition to the 5000-mile period, lubrication is recommended for certain points every 10,000, 30,000, and in the case of the Super Eight and Twelve, every 40,000 miles. In this 40,000-mile instance, rear wheel bearings on both the "Senior" models are to be packed at that interval with No. 3 fibre grease, and at the same time the universal joints on the Super Eight are to be repacked with an SAE 160 lubricant. The universal joints on the Twelve are equipped with two fittings and also take an SAE 160 lubricant every 40,000 miles. On the Twelve, the clutch pedal shaft and the



Heated air from the engines on all 1938 Packards is carried out under the car, being directed away from the engine compartment and the body by large ducts. These ducts have openings through the bottoms of the front fender skirting

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KANSAS CITY MINNEAPOLIS

starter armature are carried in bearings which require no lubrication, and with this and the universal joint exception noted above, the Super Eight and Twelve lubrication requirements are similar.

The front end suspension system this year comes in the 5000-mile service period, with the exception of the support arm outer pins, which are to be lubricated every 10,000 miles. These points take a pressure gun lubricant and are to be found in a similar location to those in last year's models.

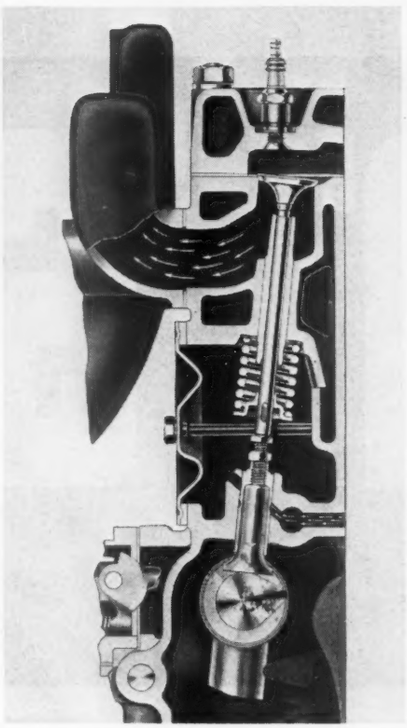
The water pump shaft, generator, and starter (except on Twelve) are also in the 5000-mile bracket and take an SAE 30 or 20W oil. There were two oilers on the 1937 "120", while on the corresponding 1938 Eight there is one oiler.

The distributor and clutch and brake pedal shaft on the Six and Eight are also 5000-mile points, the distributor having a grease cup for a No. 3 cup grease, and the pedal shaft having a lubrication fitting and taking a pressure gun lubricant.

In addition to the support arm outer pins in the 10,000-mile group are the front wheel bearings, which are to be repacked with a fibre grease, the transmission, steering gear, and the rear axle.

The transmission and steering gear take an SAE 160 lubricant, with the added suggestion that this may be diluted with kerosine or changed to an SAE 90 for winter if desired. It is further suggested that this lubricant be changed in the spring, while in the case of the rear axle, a fall change is recommended.

For the hypoid rear axle, Packard recommends only a hypoid lubricant which has the approval of its engineers, and suggests that the Packard dealer be consulted for the proper type. In its recommendations to its field service organization, Packard lists the following points: (1) Use only Packard approved lubricants; (2) Drain and refill yearly with the approach of cold weather; (3) Drain thoroughly, but DO NOT FLUSH.



On the 1938 Packard Six and Eight the engine tappets have larger contact surfaces. On these, as well as on the Super Eight model, lubrication is provided with filtered oil under full engine pressure

With the exception of the Twelve, the clutch and brake pedal shaft was formerly lubricated with an SAE 30 oil through two wicks. These have been replaced by one lubrication fitting which takes a pressure gun grease.

The universal joint journals, which formerly required a pressure gun grease, now take an SAE 160 lubricant. The drive shaft spline on all models is equipped with a fitting and takes a pressure gun grease every 5000 miles.

The cooling systems of the Six and Eight are both drained in a similar manner. Drainage facilities are provided by a drain plug at the rear end of the cylinder block and a valve in the radiator lower outlet casting. Both must be opened to empty the block and radiator core.

On the Super Eight the cooling system is drained by turning the valve at the rear face of the oil cooler housing on the left side of the engine and the valve in the radiator lower outlet casting.

The Twelve cooling system is drained by turning the valves at the bottom of the water jacket on each bank of cylinders, in the radiator lower outlet casting, and at the bottom of the condensor tank under the right front fender.

Crankcase oil capacities on the Six and Eight have both been reduced from a former 7 quarts, to 6 quarts. This change was made in June this year. The capacities on the Super Eight and Twelve remain at 8 and 10 quarts respectively.

With the exception of the Super Eight cooling system capacity, with a reduction of 4 quarts, there has been no change at this point.

The fuel tank on the Six now holds 18 gallons instead of 17, on the Eight 21 instead of 20, and on the Super Eight 24 instead of 25. On the Twelve the fuel tank capacity remains at 30 gallons.

The rear axle capacity on the Six and Eight has been increased to 6 pints from a former 5 pints, and there has been no change in the other two models. Transmission capacities remain the same as in 1937.

• • •

Plymouth and Dodge . . .

Both have Identical Servicing Requirements; Drain Period Increased; Hypoids are Continued

THE Chrysler Corp. has again simplified matters for the service station attendant by making the 1938 Plymouth and Dodge identical in their lubrication requirements. These cars match point for point and capacity for capacity, with the exception of the cooling system capacities.

Plymouth continues with its 82-horsepower engine, while the rating of the Dodge engine remains at 87 horsepower. An oil filter is used on both engines, excepting the standard or "Business" model of the Plymouth.

Both cars have a new hood design with fixed side panels, only the top sections swinging open for routine service of oil and water. The hood handle remains where it was, on the side panel; but it is now a remote control, tightly locking the top section into place or opening it partially for the fingers to lift it the rest of the way.

Both Plymouth and Dodge retain their hypoid rear axles for 1938, now designed with stronger and longer gear teeth, and both cars now have the handbrake lever located under the cowl at the center of the instrument panel, and off the floor.

On the Plymouth the steering gear ratio has been reduced from 16.4 to 14.6, and the Pitman arm has been cut to 7 inches. This combination gives an overall steering ratio of 17.6 to 1, which represents 5 per cent faster steering than last year. For 1938, Plymouth has added small roller bearings to hold the upper end of the king pins.

A new and larger Plymouth generator has a peak charging rate as high as 30 amperes, sufficient to carry the ever-increasing load found on the new cars today. The generator has an improved ventilating fan.

The Plymouth engine, with a compression ratio of 6.7 to 1, has a fuel pump of increased capacity which it is claimed will aid in preventing vapor lock. The capacity has been increased from 140 to 165 pints per hour.

Certain Dodge engine features have been retained, including the full length water jackets, steel valve inserts, pressure lubrication, aluminum pistons and

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Silvertown
HERE'S THE GOODRICH SAFETY SILVERTOWN with Golden Ply blow-out protection, that dealers everywhere find easy to sell

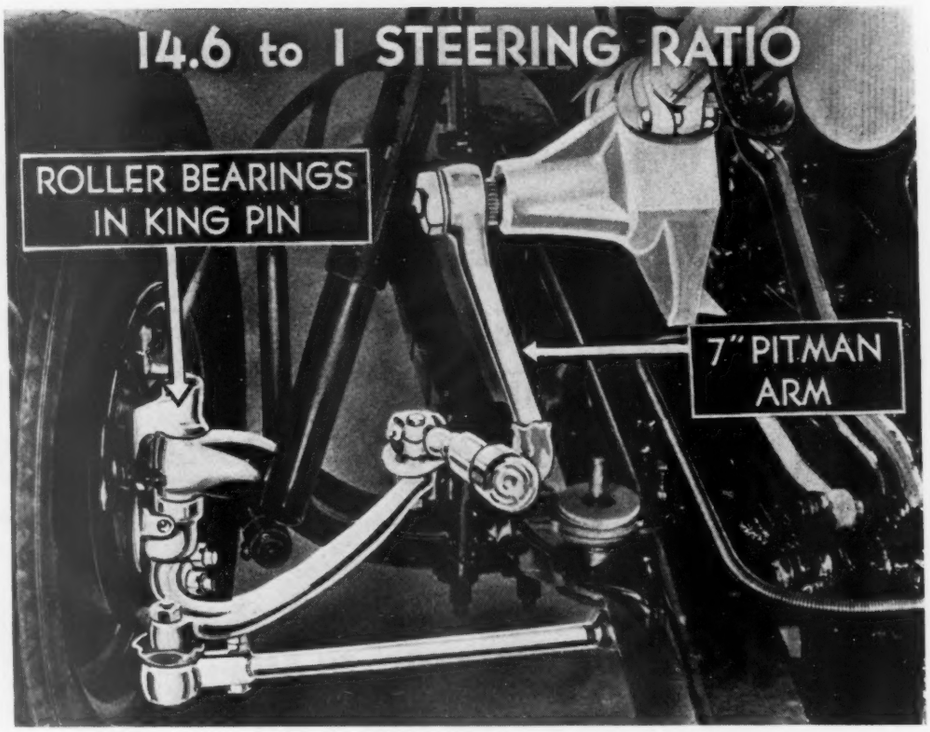
THE B. F. GOODRICH COMPANY, AKRON, OHIO

automatic choke and spark advance. There is now also an exhaust silencer of new construction and a new type compression piston ring.

Improvements have been made in the Dodge clutch mechanism. The release bearing is larger and its self-lubricating capacity is greater. The driven clutch disc has a baffle to prevent oil from reaching the friction discs.

From a lubrication standpoint, probably the most significant change on the 1938 Plymouth and Dodge pertains to engine oil drain periods and recommendations.

Crankcase drain periods for these cars are now recommended every 1500 to 2000 miles in winter and every 2500 to 3000 miles in summer. Formerly it was recommended that oil be changed at 1000-mile intervals in winter and every 1500 miles in summer. The new recommendations are to be observed when "driving conditions are normal." In the winter, when temperatures are extremely low for an extended period, and when driving is done only a few miles at a time, the car owner is urged to have the crankcase drained every 500 miles.



Improvements in the Plymouth steering mechanism include a shorter Pitman arm, now seven inches, and the addition of roller bearings at the upper ends of the king pins

THE oil filter, standard equipment on all Dodge models and on the DeLuxe Plymouth, contains a cartridge which is to be changed every 8000 miles.

In determining the proper seasonal grade of engine oil to use, a series of lowest anticipated temperatures are given which indicates the limit for the use of a certain grade of oil, as follows:

Not lower than 70 degrees.....SAE 40
Not lower than 32 degrees .....SAE 30
Not lower than plus 10 degrees.....20-W
Not lower than minus 10 degrees....10-W
Not lower than minus 25 degrees.....
.....10-W plus 10% kerosine

Last year the lower limit for the use of SAE 30 was 40 degrees. The use of SAE 20 has been dropped from the engine oil recommendations for 1938.

The transmission and steering gear, requiring seasonal changes, have identical lubricant recommendations. They take an SAE 140 or 160 fluid gear lubricant for summer, and an SAE 90 low cold test lubricant for winter. The SAE 140 recommendation is new this year. Care should be taken that the steering gear body is not over-filled, as it may overflow the steering column jacket.

The clutch release bearing is prelubricated at the factory and requires no further lubrication attention. The universal joints are also lubricated upon assembly and do not require additional lubrication for 30,000 or 40,000 miles of ordinary driving.

The hypoid rear axle now takes an SAE 90 hypoid lubricant for both summer and winter, except where temperatures average zero degrees or below for an extended period. Then an SAE 80 hypoid lubricant is recommended. This differs somewhat from the 1937 rear axle recommendation, where for summer it was specified that an SAE grade of powerful extreme pressure lubricant as specified by the refiner be used. Also last year an SAE 110 powerful e.p. lubricant was recommended for winter where only moderately low temperatures were encountered.

The rear axle should be drained and flushed out thoroughly with flushing oil (not kerosine) every 10,000 miles. Formerly this was required every 6000 miles. The attendant is cautioned against mixing one brand of hypoid lubricant with another brand. To drain the rear axle, remove the two bottom cap screws which hold the carrier to the housing. Both front and rear wheel bearings are to be lubricated with a short fibre wheel bearing grease, medium. On the front wheel bearings this should be done every 6000 miles.

On the rear wheel bearings the service is required every 12,000 miles. Here the plugs should be removed and a temporary pressure gun fitting installed. Not more than one half ounce of lubricant should be put into the rear wheel bearing, as an excess amount might be forced through the oil seal and onto the brake lining. The plugs should be replaced after the lubrication job is completed.

On both the Plymouth and Dodge 7-passenger sedans there is a propeller shaft center bearing fitted with an oil cup. This takes an SAE 30 engine oil in summer and 20-W in winter. It should be lubricated every 6000 miles. This is a continuation of last year's design on this model, which employs a two-piece propeller shaft joined through a rigidly mounted center bearing. At the beginning of the 1937 production this was a 1000-mile lubrication point, but early in 1937 it was changed to 6000 miles.

Spring shackles and steering connections are 1000-mile points, and take a semi-fluid chassis lubricant. The locations of the points are practically the same as on the 1937 models.

DISTRIBUTOR, hand brake linkage, water pump and air cleaner are to be serviced every 2000 miles. The distributor, which was formerly equipped with a pressure gun fitting, now has a grease cup, but takes a short fibre grease as before. The water pump has a pressure gun fitting and takes "water pump grease only."

In addition to the front wheel bearings, other 6000-mile points include pedals, pedal linkage, and the generator, which take an engine oil. The generator, with two oil cups, was formerly a 2000-mile point.

With the exception of the cooling system, capacities of the Plymouth and Dodge are identical and remain unchanged from last year. Capacities follow:

Crankcase refill .....5 quarts
Rear axle ..... 3¼ pints
Transmission ..... 2¼ pints
Fuel tank ..... 16 gallons

The cooling system of the 1938 Plymouth has a capacity of 14 quarts, a reduction of one quart from 1937. The 1938 Dodge cooling system capacity has also been reduced one quart, and is now 15 quarts.

Pontiac . . .

New Manual Gear Shift Device is Optional; Oil Change Recommended at 2000 to 3000 Miles; Battery is Now Located Under Hood

PONTIAC repeats in 1938 with a six and an eight-cylinder model. Like many other manufacturers, Pontiac offers, as optional equipment and at extra cost, a new type transmission shifting mechanism which takes the shift lever off the floor to permit more room in the front compartment.

Manually operated, and known as the "new safety shift gear control", this new unit consists of a short shift lever swinging about a shaft held parallel with the steering column, with the control handle making an arc under the steering wheel and being within easy reach of the driver.

Shifting positions are the same as though the conventional shift lever were bent to the right or the transmission laid on its side, so that the customary horizontal shift through neutral now becomes a vertical movement. The operation is entirely manual.

Other 1938 Pontiac developments include the relocation of the battery beneath the hood on the left side for easier accessibility, larger water pump, and a generator with greater output.

The parting line of the hood is at the belt line, with only the upper section raised to service the engine compartment. Three easily removable wing nuts hold the lower hood section in place.

Pontiac has not gone to a hypoid axle in its 1938 models, preferring to cling to the two-part propeller shaft to eliminate the floor tunnel as it did in 1937. The forward half of this shaft is integral with and supported entirely by the transmission. Connecting the front propeller shaft with the rear axle is a short shaft with needle bearing universal joints at each end. A sliding coupling at the rear of the transmission to absorb the slip of the propeller shaft makes slip joints in the universals unnecessary.

The principal lubrication change for 1938 is found in the engine oil specifications for grade and mileage change periods. Where Pontiac formerly recommended the use of an SAE 30 for temperatures consistently above 50 degrees F., this grade is now specified only when the average daylight temperature will be 90 degrees or higher. The grades now recommended are as follows: between 110 degrees and a low of 32 degrees, 20-W or SAE 20; between 110 and a low of 10 degrees, 20-W; between 70 and —10 degrees, 10-W; and between 20 degrees and a low of —30 degrees, 10-W plus 10 per cent kerosine.

Pontiac, in keeping with the policy on all General Motors cars for 1938, has liberalized its crankcase drain recommendation to every 2000 to 3000 miles, except under adverse driving conditions where it may become necessary to drain more frequently. Pontiac last year recommended a crankcase drain every 2000 miles "under normal conditions".

Other lubrication changes on the 1938 Pontiac are minor. The transmission and rear axle on the new models take an SAE 160 or 140 gear lubricant at temperatures of 60 degrees F. and above, while last year only an SAE 160 was recommended. Winter recommendation for these points remains the same, with an SAE 90 lubricant being specified.

It is further pointed out that extreme pressure lubricants may be used but hypoid lubricants are not recommended for use in the transmission . Since the rear axle is of the spiral bevel type, hypoid lubricants are not necessary at this point, but Pontiac engineers state that they may be used if desired.

It is recommended that the level of transmission and rear axle be checked every 1000 miles and that they be drained and refilled "twice a year in accordance with weather conditions".

The only other change is found in the generator, which now has two points that take a light engine oil every 1000 miles, instead of one point as formerly.

The Pontiac has a sealed water pump bearing and requires no lubrication attention. This new type bearing is not new to the 1938 line, having been used on all 1937 models since the beginning of the year. Prior to that time the water pump bearings had two lubrication fittings, one for chassis lubricant and the other an oil cup for engine oil.

The knee action front end is continued on both the Six and Eight, with no change in lubrication requirements. The location of the front end points remain the same as in 1937 and the service interval is continued at 1000 miles.

The new safety shift gear control, mentioned as optional equipment earlier in this article, is lubricated at assembly and requires further lubrication only when the parts are disassembled.

The Pontiac service department offers the following instructions for lubricating the safety shift control when assembling:

"When assembling, apply lubriplate to the following parts:

1. Threads, plugs, plunger and bearings in upper end of the shift shaft.
2. Lower end of rod and bearings in lower end of the shift shaft.
3. Ball joints in ends of gear shift control rod assembly."

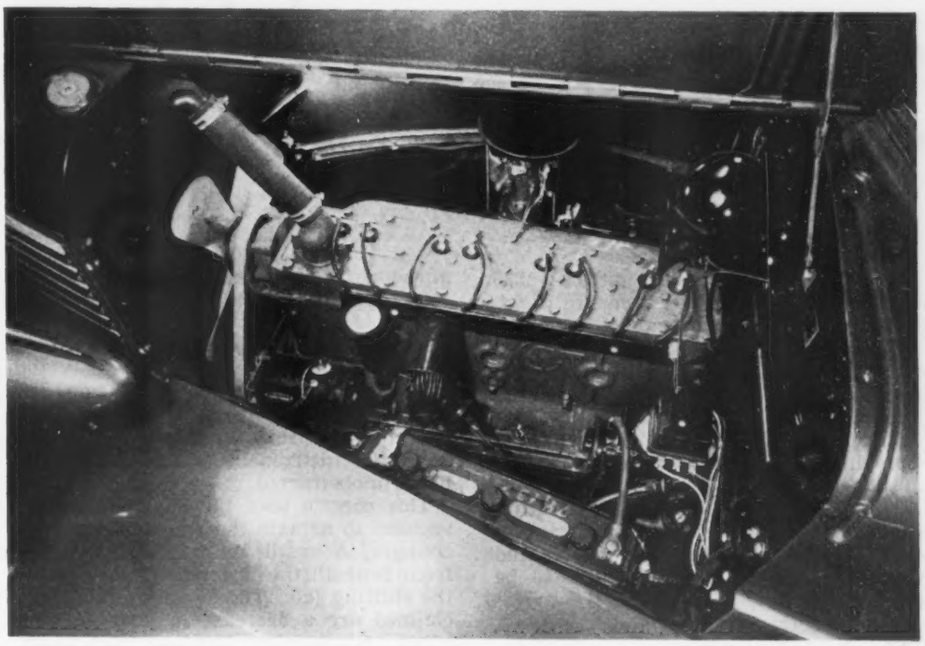
Caution is also urged in the instructions to not apply lubricant to the selector rod rubber sleeve.

The clutch release bearing is an oil-impregnated graphite composition which requires no lubrication attention. However, should the bearing become dry in service, the bearing collar is supplied with a lubrication fitting. It is reached by removing the clutch housing cover.

Front wheel bearings need not be lubricated until wheels are removed for other work. Bearings should then be thoroughly cleaned and balls and races coated with No. 2½ cup lubricant or a special wheel bearing lubricant.

Except for crankcase and cooling system capacities, the 1938 Six and Eight lubrication recommendations and capacities are identical.

There has been no change over 1937 in



This view under the hood of the 1938 Pontiac shows the new location of the battery, which facilitates filling and checking

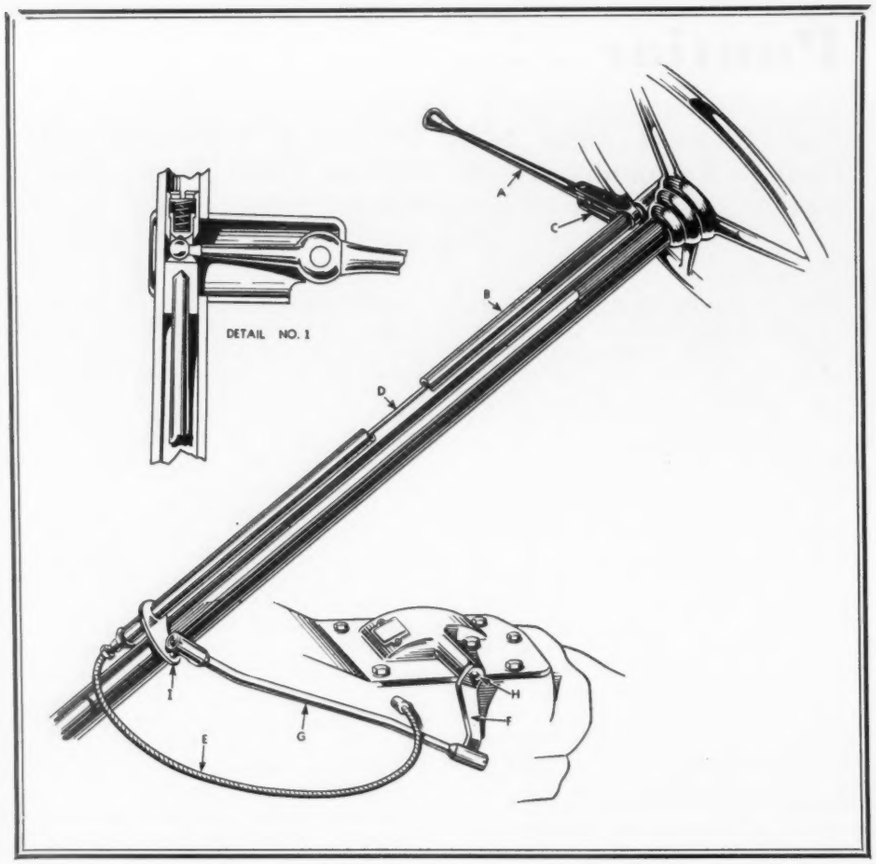
the capacities of the units. The crankcase of the Six takes 6 quarts, and the Eight 7 quarts. The differential has a capacity of 3 pints, and the transmission 1¾ pints. The fuel tank on both models holds 18 gallons. The cooling system of the Six has a capacity of 16 quarts, while the Eight takes 19 quarts.

Pontiac Safety Shift Gear Control

Pontiac in 1938 offers this new optional gear shift, in which the lever (A) swings about the shaft (B) held parallel with the steering column. Shift positions are the same as though the standard gear shift lever had been turned over on its right side, bringing the familiar "H" up from the old position on the floor to a position on its edge under the steering wheel. In this position the shifting is exactly the same as the standard type, except that the crosswise movement through neutral is now vertical. The clutch pedal is used in the same manner as with the conventional gear shift.

Gear shift lever (A) is pivoted in housing (C) at a point approximately ¾ of its length from the outer end. The inner end of the lever terminates in a ball joint (detail No. 1). Motion of the gear shift lever parallel to or in line with the steering column moves the selector control rod (D) up or down inside the shift shaft. Lower end of the rod is connected to the selector control cable (E), which runs into the transmission case and is attached to a hook on the selector plate.

Housing (C) in which the gear shift lever is pivoted is attached to the hollow shift shaft (B) above the steerling column. Movement of the shift lever parallel with the steering wheel rim rotates the shift shaft.



Lever (I) is attached at the lower end of the shift shaft. The ball jointed control rod (G) connects the lever (I) with the outer lever (F), which is attached to shaft (H) projecting from the transmission cover. A gear shift shaft inner lever is attached to the inner end of the transmission cover shaft and contacts the shift bar or engaging portion of the shift mechanism. Movement of lever (F) is translated into engaging or disengaging the transmission gears.

• • •

Studebaker . . .

Filter-Equipped, Recommends Seasonal Oil Change - . . Continues Use of Hypoid Rear Axles

STUDEBAKER enters 1938 with three cars—the President Eight, the Commander Six, and the Studebaker Six. The latter two models are identical with the exception of certain optional features which are available only to the Commander and the President.

Studebaker, in its 1938 specifications, is equipping all its models with an external oil filter, now with a deeper cartridge, which, it is claimed, makes an oil drain necessary only for seasonal changes, provided the oil filter cartridge is replaced when the dip-stick shows the oil to be dirty.

With all 1938 models equipped with hypoid rear axles, Studebaker continues with its recommendation of last year by specifying a Studebaker hypoid lubricant only for this point.

The water pump on the President engine has been moved to the front of the block, and the inlet to the oil pump is now on a pivot so that it always takes oil from the top.

New on the Studebaker this year, and offered as optional equipment on the President and Commander, is the vacuum-operated gear shift which is manipulated from the instrument panel, leaving the floor unobstructed.

This control uses the engine manifold vacuum to actuate the transmission gear changes. A small shift lever, extending from beneath the instrument panel, does the shifting job. The obvious advantages claimed are a decrease in gear shifting effort and complete freedom from levers in the front compartment floor.

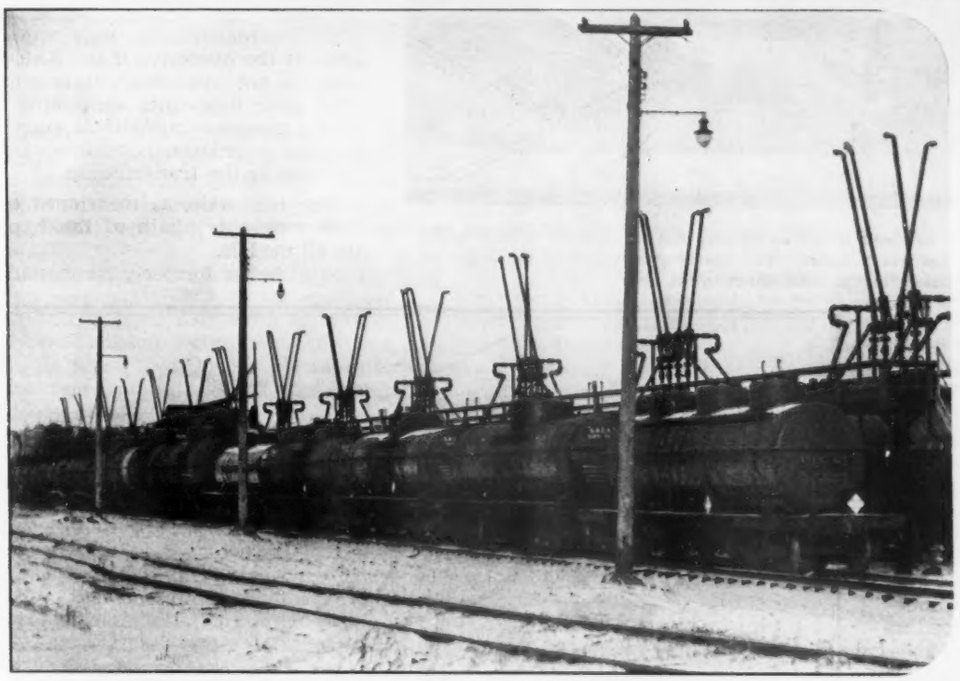
Shifting with this device can be done quickly or slowly, such control being made possible because of a balanced valve construction through the medium of a "walking beam," which prevents the vacuum cylinder from working ahead of the control lever. The vacuum-operated shift also includes a mechanical hook-up which permits a manual gear shift with the same lever should it be necessary to shift the gears without starting the engine.

By simply turning the transmission case on its side, Studebaker engineers have been able to reduce the vertical height of this unit to 7 inches, instead of 10⅝ inches as in the former design. This permits a decrease in the height of the tunnel in the front compartment.

Dual steering arm controls are incorporated in the steering mechanism of the new models. A re-location of steering pivot points has achieved a closer harmony between the front wheel action, and spring and steering control. The steering gear arm is connected by a tie rod to a similar arm, which is pivot-mounted to a rigid frame bracket on the chassis frame. Both arms have identical motion and are directly connected by reach rods

A Vacuum Breaker empties the sliding Assembly Sleeve and bottom loader before lifting from the tank. It doesn't waste a drop!

Because they stop the losses, Oilco Dome-Type Assemblies are being used as standard equipment by leading companies.



Gulf Refining Co. uses Oilco Dome-type Assemblies at its Hoven Terminal, Cleves, Ohio.

This battery of Dome-Type Tank Car Assemblies shows how each Oilco loader replaces 2 pieces of old-type equipment.

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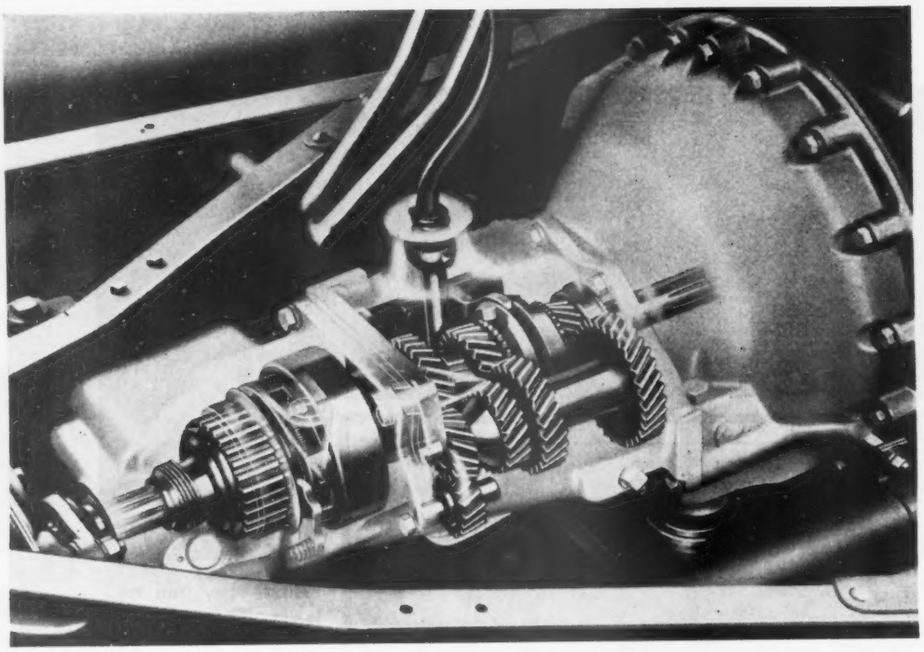


The transmission in the 1938 Studebaker has been turned on its side, thus reducing the vertical height of the unit from a former 10⅝ inches, down to 7 inches. This change greatly reduces the height of the tunnel necessary in the front compartment

to their respective steering knuckle arms. There is an increase of only one lubrication point over the steering mechanism of the 1937 Studebakers.

The Studebaker front wheel planar suspension continues unchanged in principle for 1938, with the exception that it will now be standard equipment on all models. The conventional front springing on the low priced model last year has been discontinued.

The "hill-holder," introduced by Studebaker two years ago, will be continued in 1938 as standard equipment on the President and Commander, and optional on the Six.

The overdrive, of the type used as optional equipment on the Dictator model in 1937, will be offered as optional equipment on the 1938 President and Commander models. It is available with free wheeling and may be cut in at speeds from 40 to 45 miles per hour.

Engine oil specifications for 1938 are recommended on a basis of lowest anticipated temperatures. For summer when the average daytime temperature is 90 degrees or above, an SAE 30 is recommended. For spring and fall, when the lowest anticipated temperature is plus 32 degrees, an SAE 30 is also recommended; and when the lowest anticipated temperature is plus 10 degrees, an SAE 20 is to be used. During the winter season, when the lowest anticipated temperature is minus 10 degrees, an SAE 10 is recommended.

The conventional transmission, which last year required an SAE 70 and 50 engine oil for summer and winter respectively, has now been changed to take an SAE 90 gear lubricant all year round.

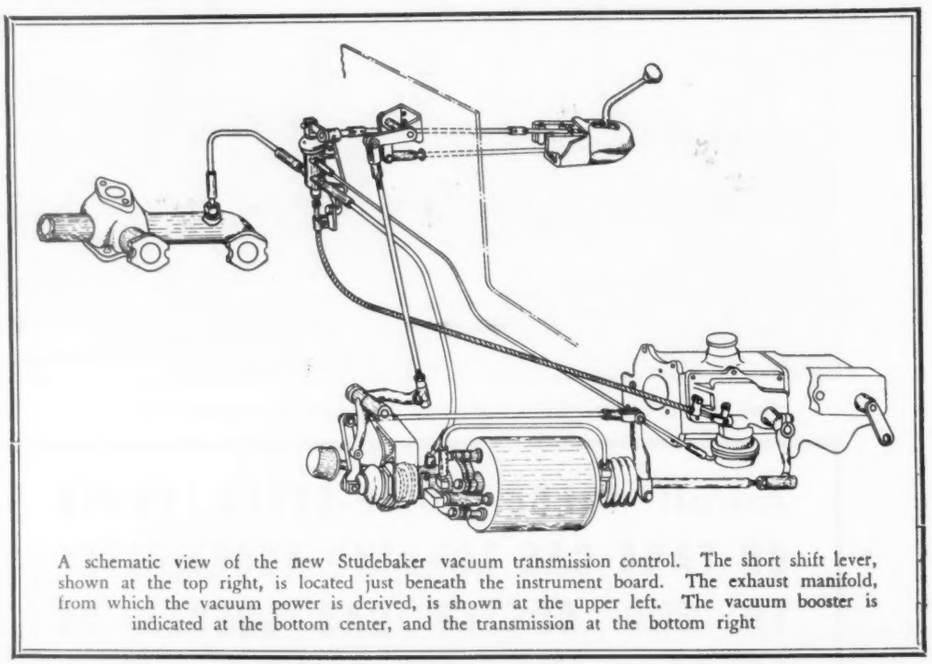
This change in recommendation is also true for the transmission with overdrive, although the company states that the 1937 recommendation may apply in the case of the overdrive if the SAE 90 lubricant is not available. It is emphasized that gear lubricants containing any extreme pressure ingredients such as lead, sulphur or chlorine compounds should not be used in the transmission.

The rear axle, as mentioned earlier in this article, is again of the hypoid type on all models.

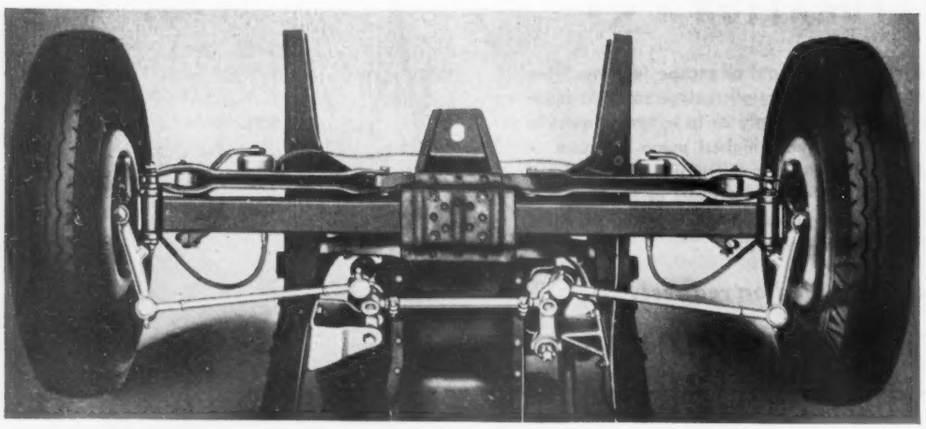
Studebaker formerly recommended that only its own branded hypoid lubricant be used, but for 1938 this restriction has been removed. The factory now recommends that "any hypoid lubricant which is manufactured by a reputable oil company" may be used. The company cautions against mixing various brands of hypoid lubricants, and points out that if the brand is changed the housing should be drained and flushed before filling with new lubricant.

The universal joints on the Commander and the Six are rubber insulated, similar to those used on the Dictator in 1937, and require no lubrication attention. On the President model, the two universal joints each require a pressure gun lubricant every 10,000 miles, while the propeller shaft spline takes a similar lubricant every 1000 miles.

The speedometer cable takes an SAE



A schematic view of the new Studebaker vacuum transmission control. The short shift lever, shown at the top right, is located just beneath the instrument board. The exhaust manifold, from which the vacuum power is derived, is shown at the upper left. The vacuum booster is indicated at the bottom center, and the transmission at the bottom right



The new steering control on the 1938 Studebaker provides an exact symmetry of force due to the rod across the center joining the two steering knuckles. One new lubrication point is to be found on the steering pivot arm

N.P.N. says this is an advertisement but we say it's national petroleum news

Who Else Wants A 33% Increase?

IF this seems like a silly question, remember that month after month this page has recorded stories of companies like your own which have made increases in gallonage ranging from 25% all the way up to 200%.

Now obviously we don't pretend that every Phillips customer made gallonage gains like those mentioned above. At the same time, however, we do want to call your attention to the fact that these are not hand-picked cases.

The sum and substance of our story is: that we've got a great line of quality products; that they are extremely well and widely advertised; that they have unusually high acceptance by car owners; and that folks who sell them generally show real increases in gallonage and profits, besides finding out that Phillips is a grand outfit with which to do business.

In support of the foregoing, we quote a recent letter from Mikan Brothers, 314 East Main Street, Durand, Michigan, signed by Milton Mikan.

He says:

"Upon checking over our records for the past year we believe you will be interested in knowing that we show approximately a 32% increase in '66' gasoline sales, with motor oil and grease sales keeping pace, as compared with the same period for 1936.

"We are highly gratified with this record which we can only feel reflects the exceptional popularity and unusual public acceptance of our products. We say 'our' products because we feel like one of the family, due to the atmosphere of friendship and fraternity that has marked our relationship with all in the Phillips organization with whom we have come in contact.

"Our goal for 1938 is a 40% increase in sales, and judging by the past and the way our customers are responding this winter to 'genuine High-Test gasoline' sold at the price of regular, we may even exceed it.

"May we extend our thanks to you for your helpful cooperation which has been of such indispensable assistance to us in hanging up this very gratifying record. With that pleasant association we look forward to the future with confidence."

Get the facts, without obligation

Maybe you're not ready to commit yourself definitely to switching from your present line. Maybe you're just looking around, merely curious to find out what there is to the Phillips proposition.

In any case, Phillips will be glad to hear from you. Ask any questions you like, or just tell us to send complete details. Our reply will get down to brass tacks and make sense to any practical operator. Just write, wire, or phone:

PHILLIPS PETROLEUM CO.
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Chicago Minneapolis Peoria
Indianapolis Des Moines Omaha
St. Louis Kansas City Wichita
Tulsa Amarillo

Two interesting facts are proved by this photograph. First: It is easier to get good success stories from sellers of Phillips 66 than it is to get good photographs. Second: Mikan Brothers give their customers such good service, that they won't even bother to turn around and face the camera when a picture of the station is being taken. Such service, backed up with quality Phillips 66 products at the right prices, has helped Mikan Brothers of Durand, Michigan, achieve their remarkable record of results.

90 lubricant every 10,000 miles, instead of an SAE 110, as formerly. The clutch pedal linkage is to be lubricated with an SAE 30 engine oil on all models, instead of an SAE 110, as was recommended in 1937.

Instead of an SAE 110 gear lubricant every 1000 miles, the spring shackles now require a pressure gun lubricant, and the fan on the President model now takes a pressure gun lubricant instead of an SAE 20 which was required last year.

Some changes are to be noted in the redesigned steering mechanism. A new point is to be found on the steering pivot arm on all models, which takes a pressure gun lubricant every 1000 miles. The outer bearing of each steering knuckle support arm, also a 1000-mile point, now takes a pressure gun lubricant instead of an SAE 110 gear lubricant. The same is true of the steering knuckles.

The distributor grease cup, formerly taking a chassis lubricant, now requires a wheel bearing grease.

No lubrication difficulties are to be found in the vacuum-operated transmission shifting mechanism, the points being limited to the oiling of the simple linkage points.

Crankcase capacities remain the same, with 8 quarts for the President, and 5½ quarts for the two Sixes. The conventional transmission capacity of the Six models remains at 2½ pints, while on the President it has been reduced from 3 to 2½ pints. The capacity of the transmission with overdrive has been reduced from 6 to 4 pints on the Six models, and from 4½ to 4 pints on the President. The rear axle capacity on all models is now 3 pints, the President having been reduced from a former 3½ pints. The cooling system capacity on the Sixes has been increased by one to 14 quarts, and by a similar amount on the President to 17 quarts. Gasoline tank capacity remains the same as before on all models, at 18 gallons.

The new car design is supplied with a lift-top hood, similar to the type used in 1937.

• • •

Willys . . .

Recommends SAE 90 Gear Lubricant For All Year In Transmission; Battery Under Hood

WITH a 1938 production schedule of 125,000 units, Willys will become a more frequent visitor at the nation's service stations as the year advances.

There are few changes on the 1938 model. The one piece hood lifts from the bottom of the radiator ventilators, making all parts of the engine readily accessible. The battery is again located under the hood.

In the chassis, improvements include a faster steering gear ratio, and a change in the low and intermediate gear ratios to add flexibility and power on heavy grades. A syncro-mesh helical cut silent gear transmission is used. The main and clutch shafts are mounted on ball bearings, and the clutch release bearing is of the self-lubricating type.

Changes in lubrication requirements on the 1938 Willys are few. The transmission, which formerly required an SAE 160 gear oil for summer, and an SAE 90 for winter, now takes an SAE 90 both winter and summer.

The rear axle continues to take an SAE 160 gear oil for summer, but now requires an SAE 90 for winter, instead of an SAE 110 as formerly.

At the end of each season, or every 5000 miles, both the transmission and rear axle should be drained and refilled.

Crankcase oil recommendations are as follows:

For summer .....SAE 30

For winter

Not lower than 32 degrees F .....SAE 20 or 20-W

Not lower than 10 degrees....20-W

Not lower than minus 10 degrees 10-W

Below minus 10 degrees..... .....10-W plus 10% kerosine

It is recommended that all shackles and steering mechanism parts be lubricated every 1000 miles with a semi-fluid gear oil of the type specified for the transmission and differential.

The level of the lubricant in the steering gear housing should be checked every 5000 miles, and kept filled at all times with a special steering gear lubricant. Willys instructions point out that the use of graphite, white lead, or a heavy solidified oil at this point should be avoided.

Every 250 miles the fan and water pump shaft bearings should be lubricated by turning down the grease cup one-half turn and putting engine oil in the oiler in the front bearing. The grease cup takes a waterproof grease.

The grease cup on the distributor should be given a half turn every 500 miles, taking a short fibre grease. Every 1000 miles a few drops of engine oil should be applied to the wick in the top of the distributor shaft which is accessible by removing the rotor arm, and also a few drops on the breaker arm pivot. At the same time a little vaseline should be applied to the breaker cam face.

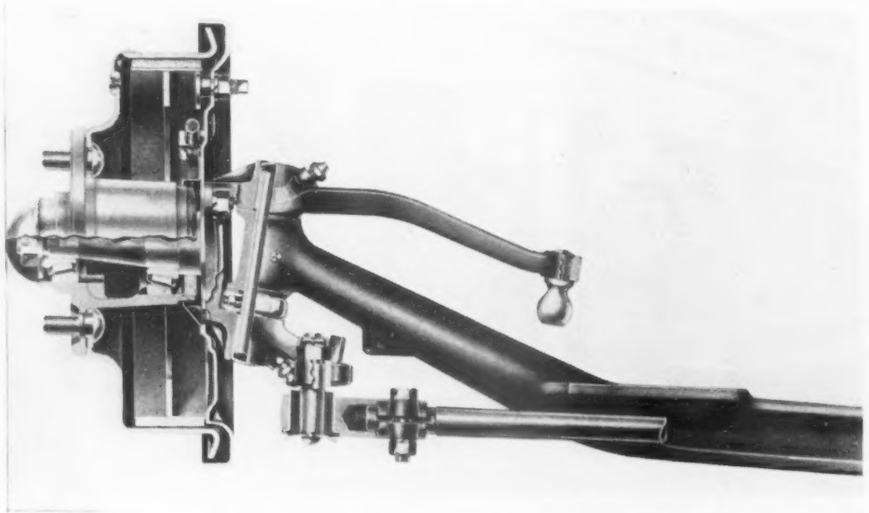
Engine oil should be applied every 1000 miles to the hole at the rear end of the starting motor, and every 500 miles in the oilers at each end of the generator.

Every 3000 miles the universal joints at each end of the propeller shaft should be lubricated with a special universal joint or fibre grease. Care should be taken to see that leather boots are only about half full of the lubricant, as too much lubricant will cause the boots to break. Later in 1938 self-lubricating universals will be used.

The front wheel bearings should be removed and the bearings washed and repacked with wheel bearing lubricant every 5000 miles. Fittings are provided for lubrication of the rear wheel bearings every 3000 miles with a semi-fluid gear oil. Care should be taken here, as too much lubricant will leak onto the brake.

Oil or grease should not be applied to the shock absorber connecting links.

All capacities remain the same as last year, as follows: Crankcase, 4 quarts; transmission and differential, 1¼ pints each; cooling system, 11 quarts; and fuel tank, 8 gallons.



Front wheel and axle section of the 1938 Willys

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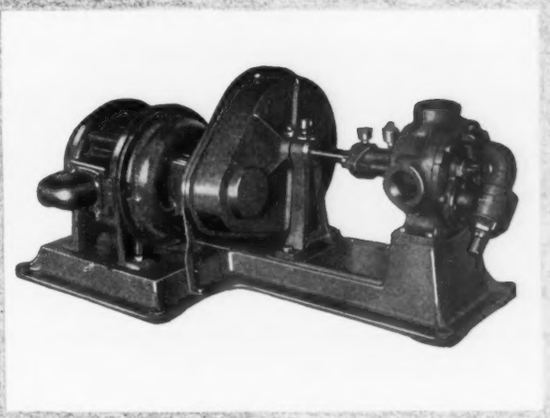
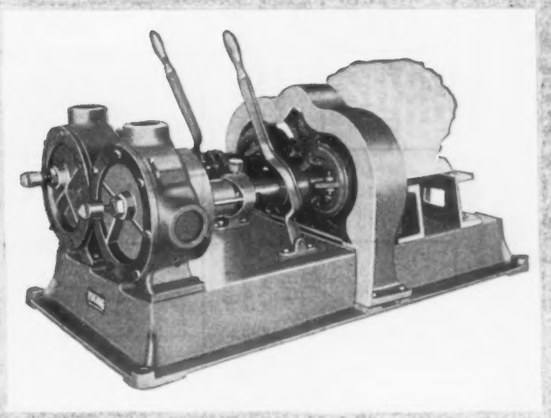
The Viking Pump is built in the largest exclusive rotary pump factory in the world. And this factory has been built on the PERFORMANCE of its product and NOT on promises.





Today there are more Viking Pumps used in the petroleum industry than any other make. Many of these pumps have been giving constant, efficient service for 20 years.

Viking has been copied in design by more manufacturers than any other style and today Viking is STILL FIRST in the field of all rotary pumps. It will pay you to investigate . . . write for bulletins.

VIKING PUMP CO.

CEDAR FALLS, IOWA

1938 PASSENGER CAR CAPACITY CHART

With Lubricant Recommendations

MAKE and MODEL	CRANKCASE						TRANSMISSION			DIFFERENTIAL				
			Use this grade when average day-time temperature is 90° F.	Use the grade of oil that will insure easy starting at the lowest expected atmospheric temperature.				Summer	Winter		Summer	Winter		
	Oil Fill Pipe Location	Cap. Qt.	Average Day-time 90° F.	LOWEST ANTICIPATED TEMPERATURE +32° F.	—10° F.	-10° F.	Cap. Pt. or Lb. (See Note)	Consistently Above 32°	Consistently Below 32°	Cap. Pt. or Lb.	Consistently Above 32°	Consistently Below 32°	Cooling System Qt.	Gas Tank Gal.
AMERICAN BANTAM														
60—1938	L	2½	40	30	20	10	1¼	160	90	2½	160	90	7	5
BUICK														
40—1938 (Conv.)	R	6	20, 20W	20, 20W	20W	10W	1¾	160	90	3	90H	90H★	13¼	18
40—1938 (Self-shifting)	R	6	20, 20W	20, 20W	20W	10W	6	(See Note)		3	90H	90H★	13¼	18
60—1938	R	8	20, 20W	20, 20W	20W	10W	2½	160	90	3	90H	90H★	17	18
80, 90—1938	R	8	20, 20W	20, 20W	20W	10W	2½	160	90	4	90H	90H★	17	20
CADILLAC														
V-8 (60)—1938	L	7	30	20, 20W	20W	10W	2½	90EP	90EP	5	90H	90H★	24	25
V-8, (65, 75)—1938	L	7	30	20, 20W	20W	10W	2½	90EP	90EP	6	90H	90H★	25	26
V-16 (90)—1938	B	11	30	20, 20W	20W	10W	2½	90EP	90EP	6	90H	90H★	30	26
CHEVROLET														
Master (HA, HB, HG)—1938	R	5	30	20, 20W	20W	10W	1½	90	90	3	90H	90H★	14	14, 18
CHRYSLER														
Royal 6 (C18)—1938 (Conv.)	L	5	40	30	20W	10W	2¼	160	90	3¼	90H	90H★	20	16
Royal 6 (C18)—1938 (With T.O.)	L	5	40	30	20W	10W	3¼	70	50	3¼	90H	90H★	20	16
Imp. 8 (C19)—1938 (Conv.)	L	6	40	30	20W	10W	3¼	160	90	3¼	90H	90H★	20	16
Imp. 8 (C19)—1938 (With T.O.)	L	6	40	30	20W	10W	4½	70	50	3¼	90H	90H★	20	16
Cust. Imp. 8 (C20)—1938 (T.O. Std.)	L	6	40	30	20W	10W	6¼	70	50	6¼	90H	90H★	20	20
DE SOTO														
6 (S5)—1938 (Conv.)	L	5	40	30	20W	10W	2¼	160	90	3¼	90H	90H★	20	16
6 (S5)—1938 (With T.O.)	L	5	40	30	20W	10W	3¼	70	50	3¼	90H	90H★	20	16
DODGE														
6 (D8)—1938	L	5	40	30	20W	10W	2¼	160	90	3¼	90H	90H★	15	16
FORD														
V-8 (60)—1938	C	4	40	30	20, 20W	10W	1¾	160	90	2½	160EP	90EP	15	14
V-8 (85)—1938	C	5	40	30	20, 20W	10W	2½	160	90	2½	160EP	90EP	22	14
GRAHAM														
Spec. (96, 98), Super (97)—1938 (Conv.)	L	5	40	30	20W	10W	4	160	90	3	90H	90H★	15	16
Spec. (96), Super (97)—1938 (With T.O.)	L	5	40	30	20W	10W	3	70	50	3	90H	90H★	15	16
HUDSON														
6, Terraplane 6—1938	L	5	30	20W	20W	10W	3	90EP	80EP	2¾	90EP	90EP	12½	16½
8—1938	L	7	30	20W	20W	10W	3	90EP	80EP	2¾	90EP	90EP	17½	16½
HUPMOBILE														
6 (E-822)—1938 (Conv.)	L	6	40	30	20	10W	2¼	70	50	2¾	110EP	90EP	18	16
6 (E-822)—1938 (With T.O.)	L	6	40	30	20	10W	6	70	50	2¾	110EP	90EP	18	16
8 (H-825)—1938 (T.O. Std.)	L	8	40	30	20	10W	7	70	50	3½	90H	90H★	21½	16
LA SALLE														
50—1938	L	7	30	20, 20W	20W	10W	2½	90EP	90EP	5	90H	90H★	24	25

LA SALLE														
50—1938	L	7	30	20, 20W	20W	10W	2½	90EP	90EP	5	90H	90H★	25	22
LINCOLN														
Zephyr—1938	C	5	40	30	20, 20W	10W	2½	160	90	4	90H	90H★	30	19
Zephyr—1938 (2 Speed Axle)	C	5	40	30	20, 20W	10W	2½	160	90	4½	90H	90H★	30	19
V-12—1938	L	12	40	30	20, 20W	10W	6	160	90	6	160EP	90EP	32	26
NASH														
LaFayette (3810)—1938 (Conv.)	L	6	30	20	10W	10W	3½	70	50	4	90EP	90EP	20	20
Lafayette (3810)—1938 (With T.O.)	L	6	30	20	10W	10W	6	70	50	4	90EP	90EP	20	20
Amb. 6 (3820)—1938 (Conv.)	C	7	30	20	10W	10W	3½	70	50	4	90EP	90EP	16	20
Amb. 6 (3820)—1938 (With T.O.)	C	7	30	20	10W	10W	6	70	50	4	90EP	90EP	16	20
Amb. 8 (3880)—1938 (Conv.)	C	7	30	20	10W	10W	3½	70	50	6	90EP	90EP	17	20
Amb. 8 (3880)—1938 (With T.O.)	C	7	30	20	10W	10W	6	70	50	6	90EP	90EP	17	20
OLDSMOBILE														
6—1938 (Conv.)	L	6	30	20, 20W	20W	10W	2	160	80	2½	●90H	●90H★	17	18
6—1938 (Automatic)	L	6	30	20, 20W	20W	10W	6	(See	Note)	2½	●90H	●90H★	17	18
8—1938 (Conv.)	L	7	30	20, 20W	20W	10W	2	160	80	2½	●90H	●90H★	21	18
8—1938 (Automatic)	L	7	30	20, 20W	20W	10W	6	(See	Note)	2½	●90H	●90H★	21	18
PACKARD														
Six—1938	L	6	40	30	20W	10W	2	160	90	6	90H	90H	15	18
8—1938	L	6	40	30	20W	10W	2	160	90	6	90H	90H	16	21
Super 8—1938	L	8	40	30	20W	10W	4½	160	90	6½	90H	90H	20	24
12—1938	L	10	40	30	20W	10W	4½	160	90	6	90H	90H	40	30
PIERCE ARROW														
8 (1801)—1938 (T.O. Std.)	L	9	30	30	20W	10W	7	90	80	6	90H	90H	25	30
12 (1802, 1803)—1938 (T.O. Std.)	C	11	30	30	20W	10W	7	90	80	6	90H	90H	38	30
PLYMOUTH														
6 (P5, P6)—1938	L	5	40	30	20W	10W	2¼	160	90	3¼	90H	90H★	14	16
PONTIAC														
6—1938	L	6	20, 20W	20, 20W	20W	10W	1¾	160	90	3	160	90	16	18
8—1938	L	7	20, 20W	20, 20W	20W	10W	1¾	160	90	3	160	90	19	18
STUDEBAKER														
Commander (7A)—1938	L	5½	30	30	20	10	2½	90	90	3	90H	90H	14	18
DeLuxe Comm. (8A)—1938 (Conv.)	L	5½	30	30	20	10	2½	90	90	3	90H	90H	14	18
DeLuxe Comm. (8A)—1938 (With T.O.)	L	5½	30	30	20	10	4	90	90	3	90H	90H	14	18
President 8 (4C)—1938 (Conv.)	L	8	30	30	20	10	2½	90	90	3	90H	90H	17	18
President 8 (4C)—1938 (With T.O.)	L	8	30	30	20	10	4	90	90	3	90H	90H	17	18
WILLYS														
38—1938	R	4	30	20, 20W	20W	10W	1¼	90	90	1¼	160	90	11	8

CRANKCASE — TRANSMISSION — DIFFERENTIAL — *Capacities are for Refill*

KEY

10W — No. 10W Engine Oil
10 — SAE 10 Engine Oil
20W — No. 20W Engine Oil
20 — SAE 20 Engine Oil
30 — SAE 30 Engine Oil
40 — SAE 40 Engine Oil
50 — SAE 50 Engine Oil
60 — SAE 60 Engine Oil
70 — SAE 70 Engine Oil

80 — SAE 80 Fluid Gear Lubricant
90 — SAE 90 Fluid Gear Lubricant
110 — SAE 110 Fluid Gear Lubricant
160 — SAE 160 Fluid Gear Lubricant
80EP — SAE 80 Extreme Pressure Lubricant
90EP — SAE 90 Extreme Pressure Lubricant
110EP — SAE 110 Extreme Pressure Lubricant
160EP — SAE 160 Extreme Pressure Lubricant
80H — SAE 80 Hypoid Lubricant
90H — SAE 90 Hypoid Lubricant

KEY

B — Both sides of hood.
C — Center of hood.
T. O. — Transmission Overdrive.
L — Left side of hood.
R — Right side of hood.

H — Indicates hypoid gears; special HYPOID lubricant MUST be used.
H★ — Indicates that 80H should be used for extremely low temperatures.
●H — Indicates spiral bevel gears for which hypoid lubricant is recommended or sanctioned.
Overdrive capacity included in transmission capacity given.
Note:—Buick (self-shifting transmission) and Oldsmobile (automatic transmission)—Same recommendations as for Engine Crankcase except for Summer, use SAE 30.

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Selling Car Lubrication

The Service Station Has Many Advantages And Opportunities in Selling Lubrication. Less Frequent Oil Drain Periods Have Also Brought New Opportunities to Build Confidence and Goodwill

TALKS with a number of service station operators show that many of them are so close to the trees they cannot see the forest.

In other words, too many station operators are living so close to their stations that they cannot see the many sales opportunities that meet them face to face every day of the year.

The service station is a retail outlet which the motorist must frequent two or three times a week. Here is a distinct sales advantage, for the motorist must not only come in himself, but he must bring his car with him. In other words, he brings with him an invitation for a number of sales of products which the station handles.

Few merchants are afforded the open opportunity to go over their customers' needs as are the operators of service stations.

The retailer of men's clothing, for example, would give a lot to be able to go to his customer's home and be permitted to go through his clothes closets and wardrobes to determine that customer's need for new clothes.

Even the corner drug store, if permitted to go through its customers' bathroom medicine chests, would find many more opportunities to sell tooth paste, razor blades, shaving soap, and the many other miscellaneous drug store items that find their way into the average bathroom shelves.

The store that sells ladies' dresses would consider it quite a sales advantage if it were able to send one of its sales representatives to look over the customer's personal wardrobe in her own home, and to point out the items she needed to make her selection complete.

It so happens that the service station is afforded exactly that sales advantage, except that here the motorist brings his "wardrobe" to the station, where not only the salesman can see what the car needs, but the customer can see what the station operator has to offer.

Particularly in the case of a lubrication job, the station attendant's servicing job amounts to practically a fine-tooth-comb inspection of the entire car. For 30 minutes or so, the attendant has complete access to the car, and as he goes over it point by point, he can, IF HE IS ALERT, find many opportunities to replace fan belts, windshield wiper blades, tires, batteries, radiator hose, spark plugs, lamp bulbs, and numerous other accessory items of the "must" variety.

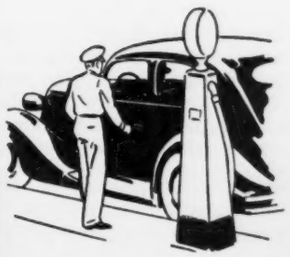
Then, too, the service station, because of its convenient location in the neighborhood, and because of the community acquaintance which the operator has with his customers, makes it the logical outlet to which the motorist should turn for his car servicing requirements.

Motorists do not resent being told that they need to replace fan belts, radiator hose, tires, batteries, or other items, provided there is an actual need for such replacement. The thing they do resent is any sales effort to sell them something which does not need replacing. There are too many cars on the road today actually in need of new parts or accessories, to run the risk of upsetting a customer by trying to sell him something which he can get along without, and furthermore, which he knows he can get along without.

Because of the great surplus of service stations, in itself a factor that contributes to the motorist's convenience, most station operators find that they cannot rely solely upon gasoline gallonage for their profits, a fact service station men know only too well.

IN Detroit recently, a survey conducted by the Retail Gasoline Dealers Association of Michigan among 118 dealers, showed that the average dealer made a net profit of only two-tenths of a cent a gallon on the gasoline which it sold after all expenses chargeable to the gasoline selling cost had been deducted.

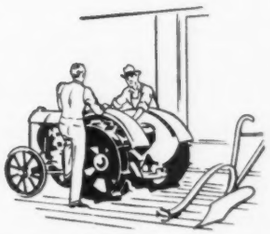
Here then, is additional proof of the need for the service station to be on its toes in regards to its customers' cars needs. Lubrication, in itself a profitable service item, can also be made to be a logical stepping stone to other profits among the accessory items. It gives the station attendant authority to give the car a thorough inspection and to discover where replacements are necessary. Better sales assistance than this cannot be had at any price, and to top it off, the customer brings the opportunity to the



SERVICE STATIONS

RURAL TRADE

CAR DEALERS



IMPLEMENT DEALERS

FLEET OPERATORS

Calumet Refining Company

Lubrication Specialists

Offers You a PLAN that helps You Sell ALL Your Prospects

You can buy all the oil you want in five minutes but not until it is *sold* are your profits realized.

Calumet's interest goes far beyond the initial sale. We provide you with a *tried and proven new Plan* that swells your sales and profits quickly and that helps you build a permanent, stable and highly profitable business easily.

You owe it to yourself and your organization to learn all about the *Calumet Plan*. Mail the coupon for facts TODAY!

Calumet Refining Co.

4323 So. Western Blvd. Chicago, Ill.

Branch: 1105 W. 11th St., Cleveland, Ohio . . . Refinery: Burnham, Ill.

Mail the Coupon for Calumet PLAN Details

Calumet Refining Co.
4323 So. Western Blvd., Chicago, Ill.

Please send me facts about the *Calumet Plan*. I'm interested in increasing my sales and profits.

Name_____

Firm_____

Address_____

City_____ State_____

Oftentimes it is the added comfort of the customers which swings lubrication business to the oil company service station, of which this Standard of Indiana station is an example

station, instead of the station carrying it to the customer.

Car manufacturers, in recent months particularly, have been alert to the advantages of lubrication service, both as a profit item in itself and also as a means of uncovering other sales possibilities for parts and accessory items. Consequently the car dealers have been made to realize the importance of this service, and there can now be found an increasing number of these outlets where lubrication is not only offered, but featured with a flair of showmanship.

As many service station operators and car dealers have found, modern grease and oil dispensing equipment plays an important part in building showmanship into the lubritorium and in building confidence in the mind of the customer for the particular establishment.

The Chrysler Corp., representing Chrysler, DeSoto, Dodge and Plymouth, as well as Hudson, Oldsmobile, Packard, Pontiac and Buick, have been active in their efforts to enthuse their car dealers over the advantages of including modern lubrication departments in the service departments.

Chrysler, in a new booklet entitled "The A.B.C. of Approved Lubrication", shows the dealer the extent of his profit for a month by lubricating one car per day for a period of 25 working days, as follows:

Income	
Chassis Lubrication (25 cars at $1 each)	$25.00
Engine Oil (12 cars, 5 qts. per car at 30c per qt.)	18.00
Gear Lubrication (3 cars, 7 lbs. per car, 30c per lb.)	6.30
Wheel Bearing (2 cars at $1.00 each)	2.00
Total Income	$51.30
Costs	
Labor Chassis Lubrication (25 cars, 30c per car)	$ 7.50
Labor Wheel Bearing Repacks (2 cars, 40c per car)	.80
Labor Engine Oil and Gear Changes	1.20
Chassis Lubricant (½ lb. per car, 10½c per lb.)	1.42
Gear Lubricant (21 lbs. at 10½c per lb.)	2.20
Engine Oil (60 qts. at 72c per gallon)	10.80
Wheel Bearing Lubricant (1 lb. at 17c)	.17
Miscellaneous Lubricants	1.50
Total Costs	$25.59
PROFIT	$25.71

The oil company, too, may be interested in Chrysler's listing in its lubrication sales folio entitled, "Seven Reasons Why Lubrication is a Profitable Business", as follows:

"(1) Lubrication is the only service required at regular, frequent periods of driving; and getting the owner's lubrication business opens the way to more general service work and profits.

"(2) Lubrication is the largest single factor in the service market. It amounts to 20 per cent of the service dollar, as compared to the 10 per cent for chassis and engine repairs, and is 35 per cent more popular than the next ranking service item, body work, which takes 15 per cent of the dollar.

"(3) Lubrication is the principal item used by competition to take business away from the dealer who sold the cars. Over 64 per cent of the car owners have their lubrication done at service stations and independent garages, and 15 per cent lubricate their own cars, while only 17 per cent of the lubrication volume goes to the dealer who placed the car on the road.

"(4) Lubrication is a feeder service. A properly operated lubrication department always increases sales of parts, accessories, and general sales and service.

"(5) Lubrication customers become friendly customers and become the contacts that influence sales.

"(6) Lubrication is the most profitable service. More than 50 per cent of the lubrication sale is gross profit; frequent lubrication service cuts the dealer's car warranty and policy expenses; and lubrication equipment will pay for itself within a year.

"(7) More new cars are sold by serving customers frequently and properly than by any other method, as the service contacts build confidence that in turn influences new car sales."

Buick has also distributed among its dealers a brochure entitled, "A Profitable Method of Operating A Lubrication Department". Here too, as in the case of Chrysler, may be found some pointers that may be of benefit to the service station operator.

The brochure points out that "the men of the lubrication department are the key men around whom practically all the dealer's contacts with his car owners are centered". It is emphasized that these men should be capable merchandisers and salesmen, and suggests the operators in large super service stations as being the "right type of men".

Following are some rather pertinent points on the maintenance of a lubrication department. They are taken from the Buick booklet, and are worthy of study by all service station operators as well as car dealers, in the common interests of better lubrication service. Following are the maintenance points covered:

"A neat, properly organized and maintained lubrication department will invite the patronage of motorists who drive in for other services. Contrarily, a disorganized and carelessly maintained set-up will both discourage patronage and detract from the general

NEW YORK OPERATORS CONSIDER THIS

The World's Finest

TRUCK-TANK MANHOLE

And so do we,

Because it meets every requirement of the N. Y. Fire Dept.

SPEED IN USE

This cover has been approved by the New York City Fire Department. If forgotten, it closes automatically and locks positively when the truck starts. Its fill opening is 10″ diameter. For letting a man down into the compartment, a full 12″ x 16″ cover can be removed without using wrenches, and its parts cannot be lost. A self-contained capacity indicator is on each manhole.

PROTECTION FROM SPILL AND LEAKAGE

This cover is absolutely tight. The fill-plug bears uniformly and tightly over its entire 10″ diameter because it floats on a ball-and-socket joint. Adjustment for gasket wear can be made without tools, simply by lifting a spring-loaded locking pin and turning an adjusting wheel. It has a drip-lip which catches all oil from the lid and makes it drip back into the compartment. The automatic closing feature makes it spill-proof in spite of carelessness.

For heavy fuel oils we manufacture a 14 inch diameter manhole of similar design with the entire cover hinged. It is fitted with four "5 in 1" vents.

SAFETY FROM FIRE

Each manhole is fitted with two "5 in 1" vents which provide free flow, automatically close in case the truck upsets, and in case of fire prevent an explosion by releasing under 6 lb. pressure. It meets all underwriters' requirements.

PERMANENT TROUBLE-FREEDOM

This manhole cannot stick from rust or corrosion. It will always work freely because hook and locking mechanism are made of high-strength bronze, and all shafts, pins and small parts are stainless steel. Its cover and plug are made of malleable iron. No cast iron is used. It is ideal for gasoline, kerosene, and ordinary grades of fuel oil.

Write for Bulletin 157, which shows details of size, weights, measurements, and prices.

PHILADELPHIA VALVE COMPANY

Aramingo Avenue and Ontario Street — Philadelphia, Pa.

Accessibility and ease of entrance are among the advantages of the oil company service station in its bid for lubrication business

effect of an otherwise well organized business.

"Decide on a pleasing color scheme, in harmony, if possible, with the colors used on containers of lubricating materials employed. Paint the entire department in an attractive manner. This includes the lift, all equipment, and the floor.

"Install chairs or a settee for the convenience of waiting customers, and if room permits, arrange an attractive waiting room with clean comfortable facilities available. Maintain everything in so clean and pleasing a manner that feminine customers will feel at ease while waiting for their cars to be serviced.

"Remove all unsightly materials, unnecessary signs, unsightly grease containers, and waste oil receptacles.

"Clean up all grease spots and dirt that may have accumulated on the floor after each lubrication job is completed. Have a small container of kerosine and a cloth handy. The hoist and all equipment should be checked for cleanliness after each operation.

"At the close of each day the department should be thoroughly cleaned and made ready for the next day's business."

The Buick manual further suggests the use of a worn parts display, showing a collection of specimens of all types of parts which have been damaged through improper lubrication. It is pointed out that the display should be placed where it can be readily seen by all customers, and the cost of replacing each part should be explained and how this expense might have been avoided through proper lubrication.

Although it is not yet mentioned above a whisper, there is evidence that some of the larger oil companies are again re-entering the retail picture. This trend at present, brought on by the unsatisfactory manner in which some dealers are maintaining their stations and selling their merchandise, is limited to key stations in larger cities. It is felt by these oil companies that their operations of these few stations will serve as an incentive to dealers to improve their methods, and also will offer the oil companies an opportunity to keep a better count on the motorist's pulse-beat, an advantage which many of them have missed since dropping out of the retail selling division.

At these company-owned key stations the much overworked word "Service" is receiving a spirited workout. The oil companies' creed seems to be, if we may judge by the activity at these key stations, that if it's service the customer really wants, let's give it to him with all the trimmings.

SO ONCE again the customer is right, for it IS service he wants, and he is proving it beyond all question of a doubt by his patronage of these SERVICE stations where the attendance do everything but brush the customers' teeth.

Just one example is typical of many which show that the company-operated station, with its vastly improved service, is doing a better selling job than do many dealers. This station, located in the east, took over a site formerly operated by a dealer. The station personnel was pepped up, service, service, and still more service was crammed into the attendants' minds until they practically had it written in their eyes, and the results gave the story a happy ending.

For during the first month under company operation, this station sold more oil and lubrication jobs than the previous operator, the dealer, had sold during his best month. During that month, under company operation, 100 more lubrication jobs were sold than during the previous operator's best month, with the total reaching 513. Likewise there was an 80 per cent increase in wash jobs.

In view of the trend this year on the part of the car manufacturers to increase the time between oil drains, the oil company service station has an increased responsibility to the motorist. There are many car owners who, particularly during the winter months, do not drive their cars frequently enough or for long enough periods at a time to warrant their observing the 2000 to 3000-mile oil change recommendation which predominates for the 1938 cars.

True, the car manufacturers point out in their instruction books that the 2000 to 3000-mile recommendations apply only to "normal driving conditions", but the definition of that term will be judged by most motorists in such a way as to best suit their convenience and their pocketbooks.

Therefore, it is the oil company service station which must, in addition to its many other services to the motoring public, educate them on the dangerous policy of too infrequent oil changes, for it is the station attendant, more than any other person engaged in servicing automobiles, who best knows the driving habits of each of his customers. (The subject of oil drains is covered more completely in another article in this issue.)

Packard is recommending, and advertising quite widely, a chassis lubrication every 5000 miles, instead of every 1000 miles as formerly. The danger of this is not so much in the recommendation itself, but rather in the effect such a claim may have upon the lubrication habits of owners of other makes of cars. Here the service station operator's responsibility is one of protecting the customer's safety while on the highway, to give his car longer life and to insure dependability of his car through proper maintenance.

Because it lubricates and fills the crankcases of the majority of the cars on the road today, the oil company service station is responsible for the proper lubrication of those cars—car manufacturers, car dealers, and garages, or no car manufacturers, car dealers, or garages.

ON THE SEA
IN THE AIR
MINING
On sea and land...in home and factory...for every lubrication and fuel problem, Shell has developed an answer.
NAPHTHAS
FUEL OILS
DIESEL FUELS
KEROSENE
GASOLINE
INDUSTRIAL
AUTOMOBILE LUBRICANTS
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Nine strategically located SHELL Refineries
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When To Change Crankcase Oil?

Recommendations of Some Car Makers For Less Frequent Drain Periods Throws More Responsibility On Station Operator To Advise on Basis of Actual Needs

THE QUESTION of when to change crankcase oil is plagued by an evasive answer.

Abraham Lincoln, once kidded about the length of his legs, made the reply that a man's legs should always be long enough to reach to the ground. When he said that, he unwittingly covered the matter of crankcase drain periods quite thoroughly. For today, the best answer to the question of how long an oil should be used is just as long as its lubricating qualities are capable of insuring proper engine operation.

And thereby hangs a tale. For on that point the oil and automotive industries agree, but the discrepancy between the two viewpoints seems to be in the opinions on when the oil has outlived its usefulness.

Because the average motorist doesn't know dirty oil when he sees or feels it, and because he must rely upon the advice of the service station operator in the majority of cases, the oil industry, in its desire to play it safe with all models and vintages of cars, recommends an overall practice of a drain every 500 miles in winter and every 1000 to 1500 miles in summer.

For its argument, the oil industry points out the little known fact that more than a gallon of water is produced in an engine by the burning of one gallon of gasoline, and particularly in cold weather some of this water condenses and gets into the crankcase. The result is often the formation of a thick emulsion which plays havoc with bearing lubrication, and it is not uncommon that the water in the crankcase freezes, thus affecting the oil pump.

The oil industry further points out, in defending its oil drain recommendations, that the oil normally undergoes gradual chemical changes in its contact with air and with the metals in the engine, a process which in time often results in the development of products which may damage bearings, cylinder walls, wrist pins, and other delicately finished surfaces in the engine if the contaminated oil is allowed to remain in the crankcase for too long a period.

The automobile industry on the other hand, striving to offer the public as wide a period between drains as is possible without cutting off its own nose, has seen fit to offer 1938 oil drain recommendations ranging from 1000 miles up to twice a year, with the majority in the 2000 to 3000-mile classification.

For its arguments in favor of these extended periods, the automobile industry offers tighter fits of piston and cylinder to reduce blow-by, improved crankcase ventilation, oil bath air cleaners, and oil filters.

The car manufacturers, in further defending their position on wider crankcase drain periods, point out that they are recommending only such practices as have proven out in their laboratory and road tests.

The car manufacturers, in making their 2000 to 3000-mile recommendations are careful to state and emphasize that these drain periods only apply "under normal driving conditions." Even those who place extreme faith in their oil filters know that these filters will not, for example, keep out the water that dilutes and emulsifies the crankcase oil.

CHRYSLER, in its 1938 recommendations to the car owner, points out the damaging effect of contaminated oil, as follows:

"Acid forms in the combustion chamber also due to natural causes in all automotive engines. Fuel contains varying percentages of sulfur and, when burned, changes to sulfur dioxide. The sulfur dioxide unites with water in the combustion chamber, making sulfurous acid.

"These accumulated non-lubricating elements in the engine oil have damaging effects on the highly finished steel surfaces. Fuel thins the oil, reducing its lubricating ability. Water is a non-lubricant and is likely to freeze, causing stoppage of the oil circulation. The sulfurous acid attacks highly finished steel surfaces and causes excessive wear. The rapidity of accumulation of these elements increases as the temperature decreases. That is why it is recommended that the engine oil be drained more frequently in cold weather than in warm weather."

Under normal driving conditions, Chrysler recommends a crankcase drain every 1500 to 2000 miles in winter and every 2500 to 3000 miles in summer. This applies to Chrysler, DeSoto, Dodge and Plymouth.

Under its recommendations on when to change oil, Chrysler states that "if driving conditions are normal," oil changes should be made as noted above. In dusty roads and dust storms, this company points out that no definite draining periods can be recommended, but that "an oil change to eliminate abrasive dust may be considerably less expensive than to take a chance on worn engine parts."

IN winter temperatures, where the car is driven only for short distances between stops, and where the engine does not become sufficiently warm to expel the water through the crankcase ventilating system, Chrysler recommends that the oil be changed about every 500 miles, and under extreme conditions, less than 500 miles, to eliminate sludge.

As an alternative to this frequent drain period during winter, Chrysler suggests that "an occasional drive of 30 miles or more at speeds of 50 miles per hour or higher will do much to eliminate the water through the crankcase ventilating system and the change period may then be extended to 1000 miles."

Chrysler for 1938 has materially increased its recommended time between drains. Formerly, this company specified a drain every 1000 miles in winter and every 1500 miles in summer, under normal driving conditions.

The General Motors oil change policy for 1938 also reflects a bit of caution in its statement to the car owner. All General Motors cars, including Chevrolet, Pontiac, Buick, Oldsmobile, LaSalle and Cadillac, follow the same oil change recommendations for 1938, with a drain being specified every 2000 to 3000 miles.

The 1938 policy of this company, as released by the engineering department to all G.M. car divisions, follows:

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driving conditions have changed and improvements in engines, such as the crankcase ventilating system, have greatly lengthened the life of good lubricating oils. However, to insure continuation of best performance, low maintenance cost and long engine life, it is necessary to change the crankcase oil whenever it becomes contaminated with harmful foreign materials. Under normal driving conditions draining the crankcase and replacing with fresh oil every 2000 to 3000 miles is recommended. Under the adverse driving conditions described in the following paragraphs, it may become necessary to drain the crankcase oil more frequently.

"Driving over dusty roads or through dust storms introduces abrasive material into the engine. Air cleaners decrease the amount of dust that may enter the crankcase; however, if the oil becomes contaminated, it should be drained promptly to prevent harmful engine wear. The frequency of draining depends upon the severity of the dust conditions and no definite draining periods can be recommended.

"Short runs in cold weather, such as city driving, do not permit the thorough warming up of the engine and water may accumulate in the crankcase from condensation of the moisture produced by the burning of the fuel. Water, in the crankcase, may freeze and interfere with proper oil circulation. It also promotes rusting and may cause clogging of oil screens and passages. Under normal driving conditions this water is removed by the crankcase ventilator but if water accumulates it should be removed by draining the crankcase as frequently as may be required.

DURING the winter months light or low viscosity oils are required to obtain easy starting. Therefore, at the beginning of the winter season the crankcase should be drained and refilled with oil of the proper viscosity for winter use. On continuous hard driving, these light oils may thicken and cause starting trouble. More frequent oil changes may therefore be required during the winter months, and a drainage period of 2000 miles for cars subjected to high speed driving conditions may be desirable, but under very severe conditions more frequent draining may be required to prevent starting troubles due to thickened oil.

"It is always advisable to drain the crankcase after the engine has reached normal operating temperature. The benefit of draining is, to a large extent, lost if the crankcase is drained when the engine is cold as some of the suspended foreign material will cling to the sides of the oil pan and will not drain out readily with the slower moving cold oil."

Studebaker, which last year stunned the oil industry with a recommendation to change oil twice a year, again in 1938 tells the same story. Equipped with an oil filter in which it has implicit confidence, Studebaker's recommendation is dependent upon changing the filter cartridge whenever the oil on the dip-stick shows dirty. Lincoln-Zephyr, also filter-equipped, recommends changes every 5000 miles, instead of 2000 as formerly.

Graham, equipped in 1938 with a similar oil filter to Studebaker, has increased its oil change spread. Where formerly a drain was recommended every 500 miles in winter and 1000 miles in summer, the 1938 recommendations call for a drain every 2000 miles in summer, with no change over last year in the winter drain period.

Nash and LaFayette, formerly every 1000 miles, is now every 1000 to 1500 miles. Packard's recommendation, formerly every 2000 miles, is now every 2000 to 3000 miles.

With 1938 offering a great preponderance of 2000 to 3000-mile oil change recommendations, a new and increased responsibility is thrown on the shoulders of the oil company service station, already bowed down with an unappreciated obligation to the American motorist. Every owner of a 1938 car should not wait for 2000 miles to roll around before draining the oil in the winter. There are many "stop and go" drivers who should change oil more frequently. It is now the service station operator's job to properly advise those drivers, and a difficult job of selling it will be, too, in view of the car manufacturers latest recommendations. For it must be remembered that when the car owner reads his instruction book, if he does read it, he will see only the 2000 to 3000-mile figures. The qualifying requirements are a part of the education that the station operator will have to give him.

A suggestion for the proper crankcase drain period for the winter "part time" drivers has been made by R. A. Wotowitch, New York, manager of the lubricating department of the Warner-Quinlan Co., who says:

"How many motorists, running on a 2000-mile basis, may not take a chance and go 2500 miles? A 1000-mile change is a more natural one. If there be an insistence to use 2000 miles as an average, why not classify as follows:

The daily car owner covering an

Some Homely Examples

The following examples may help the station operator to explain to the motorist, in terms which the motorist can readily understand, some of the reasons why his crankcase oil should be drained frequently. These suggestions were presented by J. W. Saybolt, Standard Oil Co. of New Jersey, in an issue of the Esso Dealer, a company publication:

A basin of water and soiled hands—soap plus action equals dirty water. The water is still water and could be cleaned to its original state, but it might take boiling and condensing the steam vapors to do it. One would hardly keep on using that soiled water over and over again, but would *drain and refill.* The oil in a car may be satisfactory, but the contamination by foreign matter suggests the wisdom of removing the plug in the crankcase (as in the water basin) and draining it.

Hay fever and rose fever patients virtually free of their malady while at sea—because there is no plant pollen (supposed to produce the fever) flying in the air to be inhaled. In dusty automobile country the car engine inhales the dust and gets "abrasive fever."

Oranges squeezed through a small strainer—the pulp soon plugs the holes and then the juice *and pulp* overflow into the receptacle, because the strainer has ceased to function. This compares to a plugged oil filter, with the pulp being equivalent to the solid and abrasive matter and crankcase sludge.

A glass of milk with some ice cubes to chill it. In a short time the melted ice changes the rich, creamy liquid to a thin, insipid mess. Fuel dilution does the same to crankcase oil.

A piece of polished furniture. Rub it with an oil furniture polish and the luster improves. Now, put emery dust or sand in the polish and repeat. Result—scratches. This illustrates the influence of abrasive dust or carbon in crankcase oil on the highly-finished bearing surfaces and cylinder walls in an engine.

Foods and liquids that acidify in the human system and produce or influence the growth of ulcers. Acidity in crankcase oil is ulcer-producing to the engine of the car.

With all these things as detrimental in their action as they are, subject to irregular periods of development and subject to acceleration as conditions become worse, how can anyone say that crankcase oils will run any given mileage—2000, 3000, or for three months?

The time period of use depends less on oil quality (assuming a fairly good oil to start with) than on other contributing causes, such as those outlined above which are but a few of the sum total.

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average of 50 miles per day—change every 1000 miles.

The car owner who only uses his car for pleasure, which would include evenings as well as week-ends, covering an average of 25 miles three evenings a week or 75 miles, plus week-ends of 100 miles—or a total of 175 miles—against the first group totaling 400 miles, or more—could be placed in the 2000-mile class.

In the first group the car is subjected to harder usage, and should be given more frequent service as to crankcase changes.

"In the second group, the usage would not be so severe, and as a result, a change every 2000 miles would not endanger the life of the engine.

"We gauge and schedule quite a number of other necessities and the same system could apply. The speedometer and the time covering the mileage would tell the tale very easily. By establishing a custom along these lines at filling-stations, together with the story for and against 2000 mile changes, it would develop a better revenue for the oil man. If we decide to leave the matter to the automotive manufacturers, we may find auxiliary tanks carrying reserve oil replenished with filtered oil that may well extend any sale to the 5000-mile period. The restriction of waste and the practice of economics is as important in automotive operation as any other line—however, where the danger of damaging or reducing the original value of a necessary product, such as motor oil, is so well-known, the risk of carrying on with the reduced efficiency of the lubricant can hardly be classed as economic, particularly in the face of the quantity of oil necessary and the small sum of money to pay for it."

Frequent oil changes offer the motorist the finest kind of insurance against repair bills and costly inconveniences due to engine failures. Most motorists do not realize the low cost of such insurance, and for that group it is recommended that the service station attendant present the same sales argument that the Shell Petroleum Corp., through its dealer publication, gave to its own sales and retail organization.

Shell pointed out how "penny-wise and pound-foolish" it is to drive with dirty and contaminated oil. By an example, the company showed that Motorist "A" changed oil every 1000 miles, while Motorist "B" drained oil every 1500 miles. In both cases, the total mileage driven was 7500 miles, and a quart of oil was added every 500 miles.

Then Shell pointed out the following comparison:

Motorist "A" bought 43 quarts at 25 cents	$10.75
Motorist "B" bought 35 quarts at 25 cents	8.75
Total Saving	$ 2.00

Thus Shell points out that "for $2 less, "B" damages his engine, while "A", paying an additional $2, buys himself the best known kind of motor insurance—good clean oil. "B" may figure that he's keeping his crankcase full and that there his responsibility ends—but—no matter how much oil he has in his crankcase, it won't lubricate safely if it's dirty."

One lubrication authority states that 9 out of 10 cases of complaints of engine failures due to faulty lubrication are not due to the oil at all, but rather to the impurities and foreign particles that get into the oil—a trouble that only crankcase draining can correct.

An automotive authority, when questioned on the present trend of car manufacturers to widen the span of oil change recommendations, stated

When to Change Crankcase Oil

(Figures in Miles)

(Table showing car manufacturers' recommendations for 1937-1938)

	1937		1938	
	Summer	Winter	Summer	Winter
American Bantam			2000	2000
Buick	every three months	every three months	2000 to 3000	2000 to 3000
Cadillac, LaSalle	2000	2000	2000 to 3000	2000 to 3000
Chevrolet	discretion of car owner	discretion of car owner	2000 to 3000	2000 to 3000
Chrysler, DeSoto, Dodge, Plymouth	1500	1000	2500 to 3000	1500 to 2000
Ford	2000	2000	2000	2000
Lincoln-Zephyr	2000	2000	5000	5000
Graham	1000	500	2000	500
Hudson, Terraplane	2000	2000	2000	2000
Hupmobile	....	....	1000	1000
Nash, Lafayette	1000	1000	1000 to 1500	1000 to 1500
Oldsmobile	discretion of car owner	discretion of car owner	2000 to 3000	2000 to 3000
Packard	2000	2000	2000 to 3000	2000 to 3000
Pierce Arrow	1000	1000	1000	1000
Pontiac	2000	2000	2000 to 3000	2000 to 3000
Studebaker	twice a year		twice a year	
Willys	1000	1000	1000	1000

that the "smart thing for the oil companies to do would be to make an extremely high quality oil to sell for a very high price, that would stand up under long periods of use."

The oil companies' combined answer to that, of course, is that they have the "extremely high quality oil" and that it will stand up if the car manufacturers will perfect their engines to the point where abrasive and contaminating substances cannot get to the oil. All of which brings us right back to the starting point.

The question of when to change crankcase oil is still in the hands of the service station operator to answer. It is up to him to see that his customers' cars are properly lubricated in accordance with their individual conditions under which they are operated.

The motorist wants the station attendant to check his oil. The Standard Oil Co. of Indiana, in its recent service survey in which thousands of motorists participated, proved that. As a result of this survey to determine the public's preference in regard to station service, it was found that, next to the first choice of windshield cleaning, the man at the wheel wants his tires and crankcase oil checked.

It appears, then, that the station operator is the key man in the drama entitled "When To Change Crankcase Oil." And in answering that question himself, he will do well to keep in mind Lincoln's remark about the length of a man's legs.

Compares Battery Load On 1926-36 Cars

CHICAGO — That the automobile battery bears an added burden with each additional light or electrical accessory has been well known; and now comes Pure Oil Co.'s "Pure Globe" with a comparison of electrical demand in the 1926 and 1936 models.

Following is the electrical load given for a typical 1926 model:

Two 21-candlepower headlamp bulbs	5.0 amp
One 3-candlepower tail lamp bulb	0.5 amp
One 3-candlepower dash lamp bulb	0.5 amp
Ignition	1.5 amp
Total	7.5 amp

The electrical load given for a typical 1936 model:

Two 32-candlepower headlamp bulbs	8.00 amp
Two 3-candlepower tail lamp bulbs	1.00 amp
Three 3-candlepower instrument lamp bulbs	1.50 amp
Ignition	1.75 amp
Heater	4.00 amp
Radio	8.00 amp
Total	24.25 amp

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For additional information on these capacitor-motors for gasoline dispensers, contact the nearest G-E sales office, or write to General Electric, Schenectady, N. Y., for Bulletin GEA-2277.

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More Hypoids for 1938 . . .

31 Models of 14 Makes of Cars Now Equipped With Hypoid Rear Axles; 1937 Hypoids Now Beginning to Require Drains and Refills

By JOHN W. THOMPSON
N. P. N. Staff Writer

WITH the close of 1937, the real test of the hypoid rear axle and of its lubricants begins in earnest. There have been hypoids for 14 years, but not until the introduction of the 1937 cars did they swoop down upon the oil industry in such high-production numbers.

Prior to 1937, the job of lubricating hypoid axles was extremely simple, as these units were on only higher priced cars such as Packard, and servicing was confined largely to the car dealer where it could be controlled.

One does not need to wander far in Detroit these days to hear the "Halleluiahs" that are being sung for the oil industry because of its outstanding success in manufacturing and distributing throughout the nation a type of hypoid lubricant that not only stood up in hypoid axles, but one that passed the tests imposed upon it by the car manufacturers.

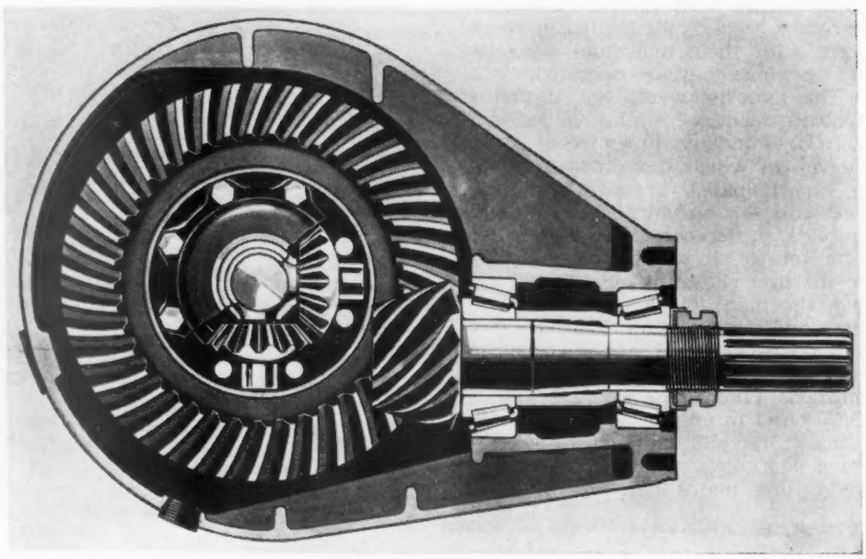
One of the nation's largest oil companies recently told this writer that only two reports of hypoid axle failures due to faulty lubrication have come to its attention during the past year, a fact which many will readily conclude is rather thorough evidence of the oil industry's mastery of the hypoid lubrication problem.

There are those, however, who believe that the crucial test of hypoid lubricants is still ahead. This opinion, and it is a logical one, is based on the belief that the majority of the 1937 hypoid-equipped cars have not yet had their axles drained and refilled.

Frank Harris Floyd, Detroit, a manufacturer of hypoid lubricants, reported last fall at a Society of Automotive Engineers meeting in Tulsa that in August, 1937, some limited automobile service data showed that only about 10 per cent of the 1937 hypoid-equipped cars had been in for a drain and refill, which would seem to further substantiate the limited but important opinions that the test of the hypoid lubricant will come in 1938.

Then too, many 1937 cars will be traded in this year, and resold to motorists who will probably be entirely unaware that they may be buying a hypoid rear axle in their car. Car manufacturers admit that they have done little, if anything, to protect the buyer of a hypoid-equipped used car with a warning that a hypoid lubricant must be used.

Here then, is an additional responsibility to be placed on the shoulders of the service station operator, to know a hypoid axle when he sees one, and to make sure that he fills it with the proper grade of hypoid lubricant when he services it.



The 1938 Lincoln-Zephyr hypoid axle

WATER HAZARD

• Some station operators have experienced difficulty with their drums of hypoid lubricant, due to water seeping in around the top edge of the drums. As a result, one large eastern oil company is urging its dealers to keep their drums of hypoid lubricant sheltered at all times, and to see that they are not in a position where they will be sprayed with a water hose during cleaning or car washing operations.

More cars have been added to the list of hypoid users in 1938. Where last year 21 models of 11 cars equipped with hypoid rear axles, 1938 finds 31 models of 14 cars so equipped. In addition to these, Oldsmobile continues last year's recommendation for a hypoid lubricant, although it is equipped with a spiral bevel axle.

All Buick models for 1938 have hypoid axles, while last year only the Series 40 and 60 used them. Likewise, the entire Cadillac and LaSalle lines are hypoid-equipped for 1938. Last year this type of axle was limited to the LaSalle and the Cadillac "60" model. Other new names to be added to the hypoid list for 1938 are the Hupmobile Eight, Lincoln-Zephyr and both models of the Graham. An accompanying table lists the complete 1938 hypoid family.

In 1937, when the large number of popular-priced, hypoid-equipped cars were dumped on the market, General Motors adopted an "approved list" hypoid lubricant policy in an attempt to control the type of lubricant used to refill the axles of its hypoid-equipped Cadillacs, LaSalles and Chevrolets. Buick last year elected to place its hypoid fate in the hands of the oil companies by recommending an

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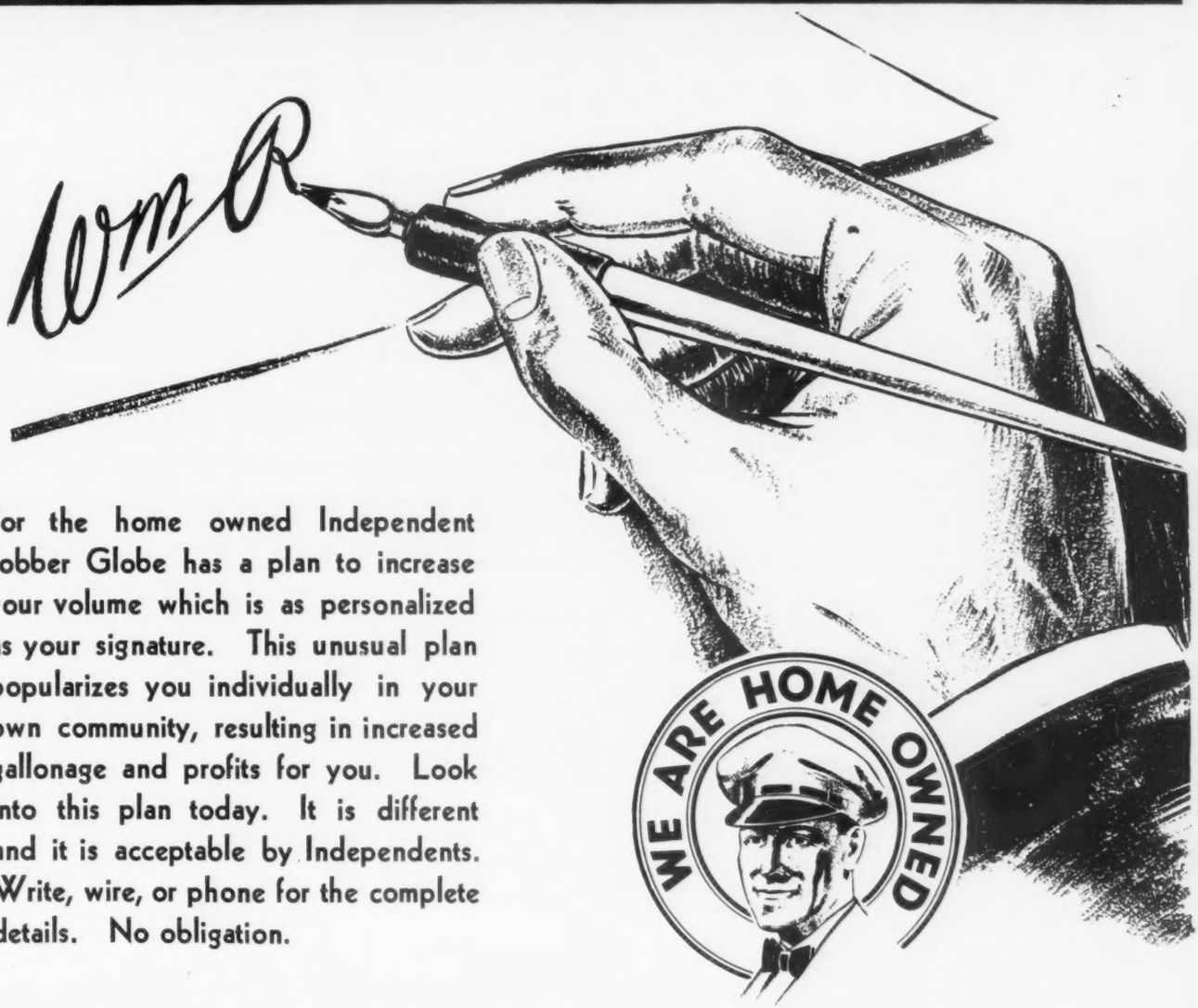

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GREEN YN *(medium emerald shade)*	ORANGE Y *(reddish orange shade)*
GREEN GN *(bright emerald shade)*	ORANGE GY *(yellowish orange shade)*
BLUE *(deep sky shade)*	ORANGE GR *(deep orange shade)*
RED *(scarlet shade)*	BRONZE ORANGE R *(bronze orange shade)*
RED B *(bluish rose shade)*	AMBER Y *(amber shade)*
VIOLET *(deep violet shade)*	BRILLIANT YELLOW *(sunset golden shade)*
PURPLE R *(bright purple shade)*	YELLOW N *(lemon shade)*
BLACK B *(deep black shade)*	

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In the case of Cadillac and Chevrolet, however, a lubricant, to be approved, first had to pass a proving ground test before being placed on the "blessed" list and passed on to the car dealers. Recommendations for servicing the hypoids of these cars during 1937 stated that the car owner should see his car dealer for the type of lubricant which the factory has approved for use in his rear axle.

Until the approved list could be developed in 1937, General Motors placed in the hands of its dealers its own brand of hypoid lubricant as a protection to "tide them over" until the approved list could be developed.

By the middle of 1937, this practice of supplying its dealers with a GM brand of lubricant had ceased, and not long after that the approved list had become so large as to be unwieldy, reaching close to 300 approved brands of hypoid lubricants for use in Chevrolet.

In view of the oil industry's success in producing a suitable hypoid lubricant, General Motors for 1938 has discontinued its "approved list" policy, and instead is recommending for summer and winter, except in extremely cold climates, the use of a hypoid lubricant with the viscosity classification of SAE 90, commonly known in the trade as an SAE 90 hypoid lubricant.

Speaking before the National Lubricating Grease Institute in Chicago last October, H. C. Mougey, chief chemist of General Motors Research Laboratory Division, discussed the hypoid lubrication situation, and particularly the proper grades of lubricants, as follows:

"During the 1937 production about half the hypoid lubricant used for original filling (General Motors hypoid-equipped cars) was of the type of lead soap active sulfur, and the other half was of the lead soap sulfur saponifiable chlorine type. Both types of lubricants gave a good account of themselves in lubricating our 1937 hypoid axles and consequently both types are covered in our specifica-

Hypoid Rear Axle Lubrication Recommendations

(As Supplied by Car Manufacturers)

Model of Car Using Hypoid Rear Axle	SUMMER Lubrication Recommendations	WINTER Lubrication Recommendations	Draining Period
Buick (all models)	SAE 90 Hypoid Lub.	SAE 90 Hypoid Lub. SAE 80 Hypoid for temp. lower than -10	Twice a year or every 10,000 miles
Cadillac (all models)	SAE 90 Hypoid Lub.	SAE 90 Hypoid Lub. SAE 80 Hypoid for extremely low temp.	6000 Miles
Chevrolet	SAE 90 Hypoid Lub.	SAE 90 Hypoid Lub. SAE 80 Hypoid for extremely low temp.	Twice a year or every 6000 to 10,000 miles
Chrysler (all models)	SAE 90 Hypoid Lub.	SAE 90 Hypoid Lub. SAE 80 Hypoid for temp. lower than zero	10,000 Miles
DeSoto	SAE 90 Hypoid Lub.	SAE 90 Hypoid Lub. SAE 80 Hypoid for temp. lower than zero	10,000 Miles
Dodge	SAE 90 Hypoid Lub.	SAE 90 Hypoid Lub. SAE 80 Hypoid for temp. lower than zero	10,000 Miles
Graham	SAE 90 Hypoid Lub.	SAE 90 Hypoid Lub. SAE 80 Hypoid for temp. below zero	6000 Miles
Hupmobile (Eight only)	SAE 90 Hypoid Lub.	SAE 90 Hypoid Lub. SAE 80 Hypoid for temp. below zero	Twice a year
LaSalle	SAE 90 Hypoid Lub.	SAE 90 Hypoid Lub. SAE 80 Hypoid for extremely low temp.	6000 Miles
Lincoln-Zephyr	SAE 90 Hypoid Lub.	SAE 90 Hypoid Lub. SAE 80 Hypoid for extremely low temp.	Twice a year or every 5000 miles
Packard* (all models)	See Packard dealer	See Packard dealer	10,000 Miles
Pierce Arrow	SAE 90 Hypoid Lub. Lead base	SAE 90 Hypoid Lub. Lead base	10,000 Miles
Plymouth	SAE 90 Hypoid Lub.	SAE 90 Hypoid Lub. SAE 80 Hypoid for temp. lower than zero	10,000 Miles
Studebaker	SAE 90 Hypoid Lub.	SAE 90 Hypoid Lub.	5000 Miles

NOTE: Oldsmobile, although equipped with a spiral bevel rear axle, specifies the use of an SAE 90 hypoid lubricant for all year service. Draining is recommended for spring and fall.

* —Has an approved list of commercially available hypoid lubricants.

tions and recommendations for 1938.

"However, from our standpoint, it is not necessary for both types of lubricant to be distributed by any one company, and, in most of the U. S. we believe that only one viscosity is required, that is, SAE 90 for both summer and winter.

"In the climates where the winters are extremely cold, SAE 80 hypoid lubricant should be used in winter, just as SAE 80 rear axle lubricant has been used for many years for lubricating the conventional spiral bevel axles in winter in these cold climates.

"As previously stated, we believe that only one type of hypoid lubricant needs to be distributed by any one oil company, and both types have been satisfactory in the present design hypoid and highly stressed spiral bevel gears in axles produced by our corporation. We would like to point out, however, that there may be hypoid gear designs which require the maximum in load carrying ability, and we believe that the tendency is toward rear axle designs in which lubricants of the maximum load carrying ability will be required.

"OUR specifications, on which we purchase lubricants for original filling of the rear axles, call for lubricants containing approximately 5 per cent lead soap, 1½ per cent added sulfur, and in the lead soap sulfur saponifiable chlorine type, certain amounts of both chlorine and saponifiable oil are also required. The specifications also require that these lubricants should meet certain stability tests and that they should give certain results when tested on the SAE extreme pressure lubricants testing machine. These tests are used to describe the kind of lubricants that we have found to be satisfactory, and which we wish to purchase for our use, but no attempt is made to include in our specifications all possible materials in all possible combinations and ranges in which they may be used.

"In order to recommend hypoid lubricants by SAE numbers, that is, SAE 90 hypoid lubricant for both summer and winter, except in the very cold climates where SAE 80 hypoid lubricant may be desired, it is evident that there should be suitable SAE specifications or classifications. At the present time, the SAE rear axle lubricant classifications are based on viscosity and fluidity at low temperatures only. The word "hypoid" is not mentioned, and in recommending SAE 90 hypoid lubricant, for example, we are only calling for a hypoid lubricant of the viscosity classification of SAE 90, without defining what properties a lubricant must have to be a "hypoid lubricant." The SAE Lubricants Committee is working on this problem and is trying to prepare a classification or write-up which will distinguish between the different types of lubricants—

(a) Mineral oils,

(b) Lubricants superior to mineral

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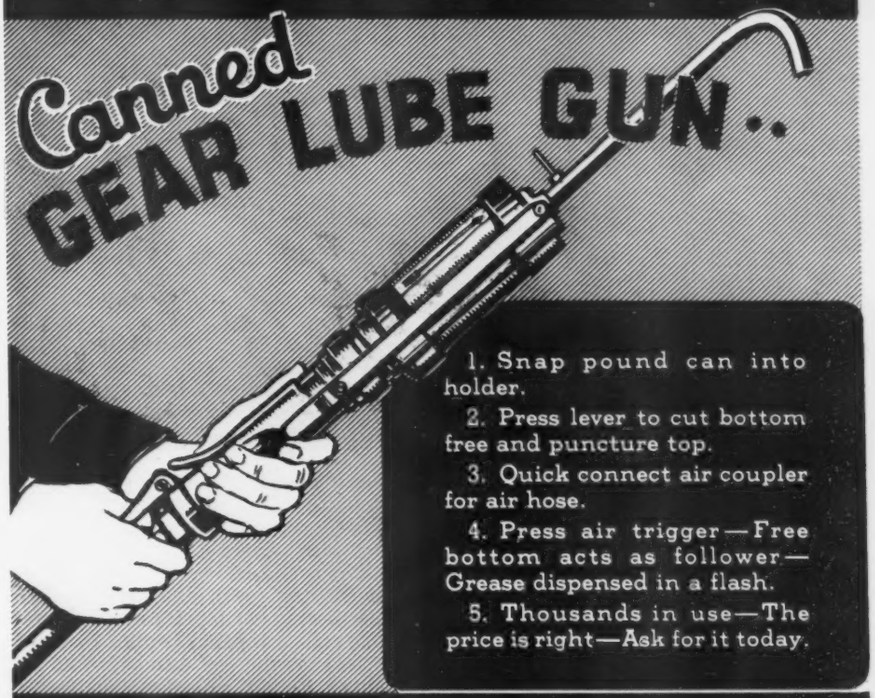

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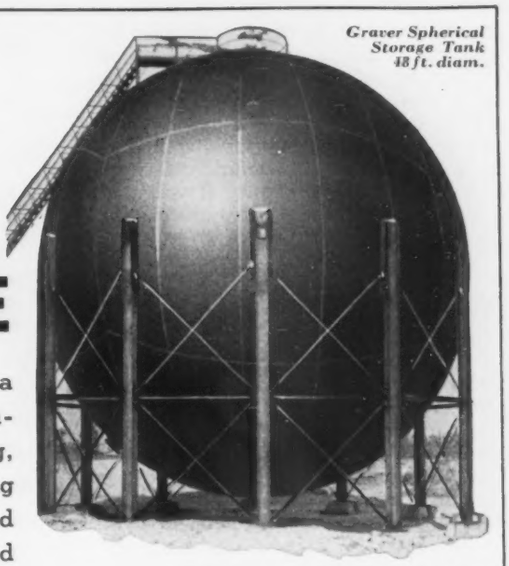

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The 1938 Packard Six hypoid axle. All Packards are hypoid-equipped. (Photo copyright, Photo-Chek Service, Chicago)

oils in load carrying ability but inferior to hypoid lubricants, and

(c) Hypoid lubricants, suitable for hypoid gears under very severe operating conditions.

"This is a very difficult problem. Classification (b) tends to merge into classification (c), depending upon the severity of the operating conditions. Most car manufacturers seem to believe that the classification for "hypoid lubricants" should be restricted to those lubricants that will lubricate hypoid gears under the very severe operating conditions, but some people believe that somewhat milder products, which will lubricate the gears under milder operating conditions, should be included. This is a commercial problem and in all probability it will take some time to reach the most satisfactory solution."

WITHOUT resorting to the "approved list" policy, Chrysler introduced the hypoid axle on its Plymouth in 1937, and results thus far have been a tribute to the oil industry's ability to manufacture and distribute a product on short notice, and also a tribute to Chrysler confidence in the oil industry. At that time all Chrysler-built, hypoid-equipped cars recommended for winter an SAE 90 hypoid lubricant, and for summer a "hypoid lubricant recommended by the refiner." Recommendations for 1938 are for an SAE 90 hypoid lubricant for all seasons, except for long periods of extremely low temperatures, when an SAE 80 hypoid lubricant is required.

This recommendation, incidentally, is typical of the majority of hypoid recommendations for 1938.

Packard is the only 1938 car with hypoid axle which still recommends a factory-approved lubricant. Studebaker discontinued its factory-approval policy of last year and now recommends the hypoid lubricant of any reputable oil company, while Packard specifies that the car dealer should be consulted for an approved list of hypoid lubricant brands.

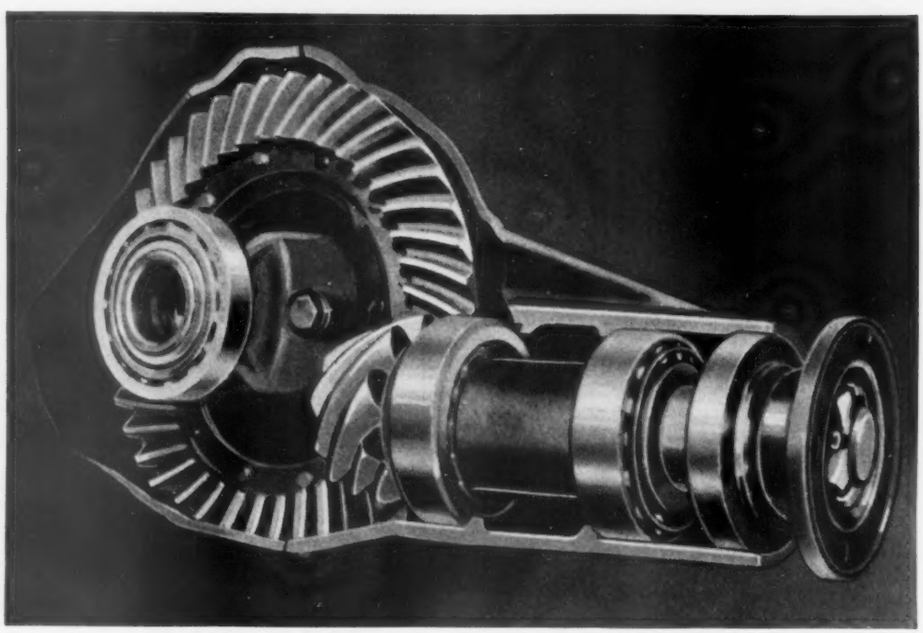
Nash and LaFayette, while not using a hypoid rear axle, specify the use of an extreme pressure lubricant and recommend that the car owner consult the car dealer for an "approved list" of such lubricants.

The two simple hypoid lubrication rules, introduced in 1937, still hold good for 1938. First, use only hypoid lubricants for hypoid axles, and second, never mix one brand of hypoid lubricant with another brand. While some leniency is beginning to be evidenced with respect to the second rule in some quarters, it is strongly recommended that the old general rule of "no mixing" still be observed.

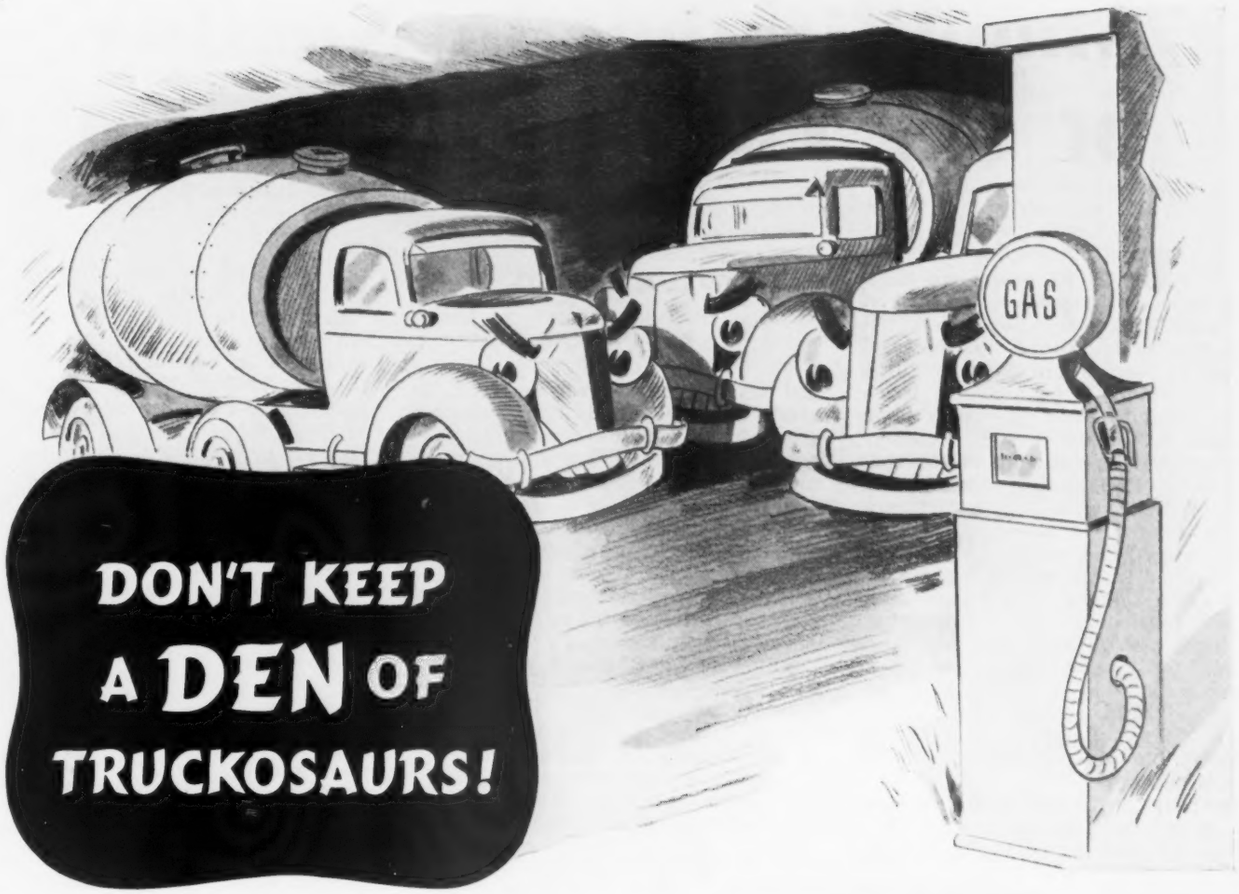
With the discontinuance of the Chrysler Airflow model, all Chrysler-built cars, including Chrysler, DeSoto, Dodge and Plymouth, are hypoid-equipped. Drain periods on these axles, formerly recommended every 6000 miles, are now specified for every 10,000 miles. The Buick and Chevrolet axles are now to be drained twice a year, or every 6000 to 10,000 miles. Packard and Pierce Arrow, likewise, have 10,000-mile drain periods for their rear axles, while LaSalle, Cadillac, and Graham hypoids are to be drained, flushed and refilled every 6000 miles. Studebaker retains its 5000-mile drain period.

STEAM, water, alcohol, gasoline, or kerosine should NEVER be used for flushing hypoid axles. A good grade of flushing oil should be used, and it is important that this oil, as well as all old oil and solid particles, be completely removed before new lubricant is added. Proper flushing of the rear axle housing and gears is a vital part of the draining and refilling service. Station attendants are urged to recognize that fact.

With the addition to the list of more hypoid-equipped cars this year, and with the refill period for many 1937 cars just now making itself felt, the need for alertness on the part of the service station operator in properly servicing his customers' cars is more pronounced than ever.



The 1938 Dodge hypoid axle, shown here, is similar to the Plymouth. The station attendant can readily recognize the hypoid axle, because the drive shaft enters the differential case below the center line of the ring gear



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Simplification in Number Of Car Lubricants Needed

By C. M. LARSON*

• • •

TWENTY years ago there were twice as many makes of cars on the road but every boy could tell them apart. How simple was the service man's lubrication chart of these cars with only three available lubricants, medium motor oil, 600 W Gear Oil and No. 3 Cup Grease. Contrast this today with the demand for specialized lubrication. The recommendations of the motor car manufacturers require four to six times this number of lubricants, due to the gadgets and the lack of standardization of lubricants. Some improvements have been made in mechanical designs improving the lubrication of 1938 cars. But the addition today to the number of lubricants recommended increased. The use of oil filters to compete with more frequent draining periods is again in evidence, but the economics of the filter is debatable.

The trend to lighter motor oils is still in evidence, for several of the 1938 cars recommended S.A.E. 10 and 10-W for new cars and Ford since last fall has dropped down to an S.A.E. 30 grade until the car is two years old after which S.A.E. 40 is reverted to. The engine operating speeds and temperatures are more critical to ring sticking and crankcase sludge. This has led to a good deal of divergence in the recommendation in crankcase oil drainage periods.

Several makes of cars have adopted a type of filter and recommend drainage at 5000 miles, on the assumption the filter will keep the oil clean. It is true that a certain amount of oil insoluble sludge is taken out by the filter. Most of the ring sticking and lacquer deposits are caused by the gum or asphaltenes in solution that only stick rings and rocker arms because local conditions make such asphaltenes that were in solution adhere to the ring, etc. at elevated temperatures.

Generally the filters are set to take out foreign particles of five one-thousandth of an inch or larger. Most of the air floating dust is of an order much smaller in size, so, too, is it true of the inorganic matter from the fuel and engine corrosion. Such particles are large enough to injure and fracture anti-friction and plain bearings which are set up much closer than these smaller abrasive particles let through the filters set even at three one-thousandth of an inch.

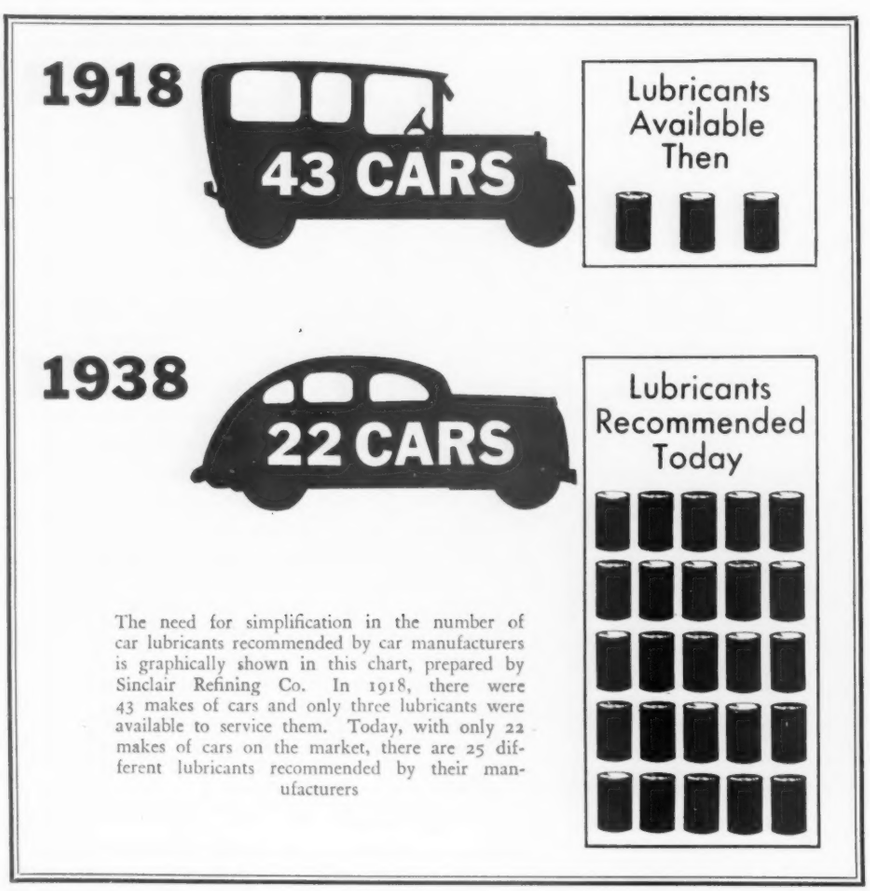
FLEET tests have shown that refill cartridges must be purchased and installed frequently to maintain the crankcase oil at any reasonable degree of cleanliness. Instead of the filter working for 5000 miles it clogs up with sludge at 1500 to 2500 miles and dirty oil is circulated for 2500 miles or more. Unless the 5000-mile drainage period is used the filter is not economical and if the crankcase oil runs 5000 miles, dirty oil is used for more than twice that recommended by the Oil Change Committee.

There have appeared several "chemical treated" filters and also those using a block of filter clay. These extract the addition agents added to oils to give them oiliness and offset corrosion, thus making such addition agents worthless. They, too, become plugged with waste sludge similar to the disc or cotton waste type filters in ½ to 1/3 the mileage recommended for the drainage periods. Never have tests shown that the acid number is kept down so that corrosion due to high acidity is still a factor, whether the car is equipped with a filter or not. The filter should be used to "lubricate for safety" not "for economy", and the good old drain period every 1000 miles for average conditions, is still a safe bet. Don't depend on longer periods set up for the most favorable driving periods.

Chassis and Spring Lubrication

There is much improvement in design for chassis lubrication especially those knee action joints, spring saddles, spring loaded shock eliminator and shackle bolts which caused 1937 cars to squeak. By the use of leather boots, or better yet through larger grease reservoirs and less exposed surfaces 1938 cars are made free from squeaks. It is possible to lubricate these new models every 1000 miles and give noiseless, squeakless per-

* Chief consulting engineer, Sinclair Refining Co., New York.



The need for simplification in the number of car lubricants recommended by car manufacturers is graphically shown in this chart, prepared by Sinclair Refining Co. In 1918, there were 43 makes of cars and only three lubricants were available to service them. Today, with only 22 makes of cars on the market, there are 25 different lubricants recommended by their manufacturers

formance, even in wet or slushy weather operation.

The question of spring lubrication is made more confusing in that two types of graphite greases, one talc asbestos and oil spraying are recommended by the various manufacturers. It has been found that the Ford talc, asbestos specification made into a grease of No. 2 consistency will handle all Fords, Lincoln Zephyrs and those springs where graphite grease is recommended, as well as for brake cables. It is not nearly so messy as graphite grease yet more effective as a spring lubricant when properly applied.

Transmissions, Hypoids and Rear Axles

Automatic or semi-automatic shifting is now available on most 1938 cars above the lowest price field. These transmissions and controls are more sensitive to lubricant viscosity changes with temperature, especially the oil pressure engine speed automatic shift. For this type of automatic transmission an oil of 200 to 240 second Saybolt at 100 degrees F. with 100 V. I. and very stable, is necessary to keep gumming down to a minimum so that operation will not be sluggish, also to keep the viscosity from becoming higher than 14,000 seconds Saybolt, the apparent cold weather viscosity limitation.

The extension of the use of hypoids is noted, for all 1937 manufacturers are using hypoids again. Buick and Cadillac now use them on all models and Lincoln Zephyr and Graham have joined the ranks. The specification requirements for hypoid gear lubricants have been stiffened in that the S.A.E. extreme pressure machine speed of 1000 r.p.m. is required instead of 750 r.p.m. Hypoid lubricants that give a perfect run at this speed and are very stable against thickening have shown perfect performance in hypoid rear axles with absence of wear.

No. 140 Gear Oil was introduced to take the place of S.A.E. 110 and S.A.E. 160. But this is only one step toward simplifying recommendations for transmission and rear axle lubricants. The responsibility of the service station operator is well beyond the proper selection of the S.A.E. viscosity numbers to be used in summer or winter. The motoring public are not gear lubricant conscious nor are they aware of the required grades available.

One large oil company has developed three new gear lubricants that have the film strength of high E. P. lubricants yet the inherent stability and low non-corrosion properties of the highly filtered straight mineral Pennsylvania motor oils. These three gear oils and a hypoid gear lubricant will properly service all transmissions, whether conventional, cruising, overdrive, dual ratio or free wheel gearing, and all rear axles, whether hypoid, spur or worm gearing—summer and winter as well. The only exception is the pressure automatic transmission of the Oldsmobile type where heavy S.A.E. 10-W is recommended. Contrast these four transmission and rear axle lubricants with 14 possible S.A.E. combinations that are being recommended for cars on the road today.

Clutch Release Bearings

The change from oil-less clutch throw-out bearings to anti-friction bearings grease packed at assembly, requiring no further lubrication, is a step in the right direction. It was found that the pores of the oil-less bearings became clogged with dirty oil. The surfaces glazed and were noisy. The grease packed anti-friction bearings have worked very satisfactorily in electric motors without further lubrication and should perform very satisfactorily for clutch release bearings.

There is a need for co-operation between the car manufacturers and the oil companies, so that simplification and standardization of lubricants based on availability of essential products will become a reality. The gadget manufacturers also should fall in line with these available lubricants. The real 1938 new car production will be in the small low priced class of utility value, and noiseless, squeakless silent operation will be the car owners' demands. The future lubrication recommendations will be simplified yet specialized. At last we are finding our way out of chaos.

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Motor Lubricants Of "Tomorrow"

By **ARCH L. FOSTER**
N. P. N. Technical Editor

● The manufacture of motor lubricants to meet the special conditions of high speeds and temperatures, use of alloys in bearings and so on encountered in motor car operation today has vastly improved over even a few years ago, the Technical Editor of NATIONAL PETROLEUM NEWS points out in the accompanying article. Research being continually carried on in oil company and automotive laboratories points towards even greater improvements to come within the next decade.

Today these oils are more and more built to meet specialized operating conditions, with the necessary characteristics carefully provided, either through improving the quality of the natural petroleum product or adding the materials which help accentuate these properties.

"The future lubricant will be an 'assembled' oil, made up of concentrated natural and synthetic products, combined with additives which help to obtain the accentuated properties which will be necessary to service the greatly increased speeds, temperatures and pressures in the automobiles to come," Foster states.

THE LUBRICANTS of the future will be more and more specialty products, built specifically for service under the more highly specialized conditions of the machinery of the future.

In other words, the lubricating oil of tomorrow will be an "assembled" oil, made up of different components, each of which adds some indispensable property to the finished product, or which eliminates some unpermissible characteristic found in the other components. One authority says we will soon make oils with the precision we now use in making metallic alloys. The complete lubricants will be synthetic for some uses, he believes.

We are trending toward that condition already, with oxidation and sludge formation inhibitors, "oiliness" agents, viscosity index improvers, pour point depressants and other additives used by various oil refiners to improve certain characteristics.

However, judging purely from the direction and nature of present trends, and from what the synthetic chemist tells us of the possibilities of organic compounds, our efforts so far, creditable as they are to the acumen and resourcefulness of the lubricating technologists, are infantile and elementary in comparison to what may be expected within the next 25 years or so.

Studying the field of lubrication we find that certain properties are of major importance in certain services. To automotive crankcase oils, viscosity index, freedom from sludging and formation of corrosive acidic materials, and "oiliness" appear to be primarily important.

In steam cylinder oils "oiliness" is most important, with viscosity index of little if any moment, since starting difficulties do not exist. For lubricating bearings at essentially atmospheric temperatures, viscosity index is a slight consideration comparatively speaking; pour point and film strength or "oiliness" is again a prime consideration. For lubricating at extremely low temperatures, viscosity at the operating temperature or pour point rules the specification list.

Here we will consider chiefly crankcase oils. The oil of the future must possess in much greater degree, as time goes on, the property of film strength, to maintain its oiliness, its absorbability on bearing and journal. It must possess a much higher resistance to oxidation in service and to decomposition under high temperatures. As a corollary to stability it must not deposit objectionable carbonaceous material in engines, or cause ring-sticking or valve-sticking by depositing resinous, gummy materials on engine parts.

So far as can now be foretold, mineral oil will be the base and chief source of tomorrow's motor oil, as it is now. However, its chemical and physical treatment, its subdivision and analytical handling will be far more specialized than now. This is because of the large supply of mineral oil and its relative cheapness. But the raw material will be dissected, separated into its components, by classes and types of similar compounds with similar properties, and these will be recombined to yield the base oil which has the properties desired in any given product and from which the undesirables have been omitted.

We already have at hand many of the tools by which this scientific separation of types of hydrocarbons can be accomplished — but as yet we know very little about their use. Extraction with selective solvents separates only fairly well, not yet quantitatively the paraffinic from the naphthenic types. This method will be improved until we can isolate the different classes of hydrocarbons, and obtain relatively pure those high in viscosity index, in oxidation stability, high decomposition temperatures and low in carbon deposition. The work now being carried on at the Bureau of Standards, in analysis of the lubricating fractions of petroleum may well be the fundamental pioneering in developing ways to segregate the lubricating fractions from the undesirables.

THE next source of the super-lubricant is synthetic methods, producing from either petroleum or non-petroleum raw materials, by chemical synthesis, lubricant components in which one or more properties are extremely high. Either lubricant bases or blending material may be and have been made synthetically and this process will contribute largely to the lubricant's make-up in the future.

Already synthetic methods have produced oils of super qualities in certain characteristics. Lubricants have been made extremely high in stability and viscosity index up to 138 V. I., but too high in pour point, by cracking paraffin wax and rebuilding it synthetically into large molecules of the desired properties, using aluminum chloride as a catalyst.

Petroleum fractions have been oxidized to yield lubricants of greatly enhanced properties, especially in oiliness or film strength. Paraffin wax has been oxidized to improve the boundary lubrication ability of lubricants. From the field of synthesis will come the highly specialized oils for special services.

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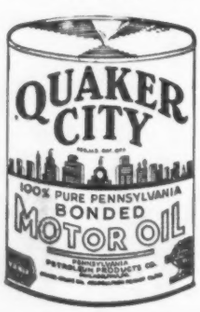

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play a serious part in the new type of lubricant. Inhibitors of oxidation, increasing oil stability, are already in use. The addition of small amounts prevent or retard the formation of sludge and acidic oxidation and decomposition products, preventing bearing corrosion, ring- and valve-sticking and prolonging efficient lubricant life. Some of the materials now used or patented for use as inhibitors are diethylene oxide, tributyl phosphite, a combination of an ester of sulfur, selenium, tellurium, etc., with an acidic aromatic ring such as homologues of benzoic acid; beta-naphthol and numerous others.

There is good reason to believe that petroleum contains natural inhibitors which, in the best lubricants, tend to take the brunt of the oxidation attack, and retard oxidizing action on the hydrocarbons actually serving as lubricants. Some technologists believe that the inadvertent removal of these natural inhibitors explains some of the troubles with solvent-refined oils experienced a year or two ago, and that, to use solvent extraction as an amenable tool, means must be found to either avoid removing these natural inhibitors or to replace them in the oil. The chemists of tomorrow will doubtless concentrate these bodies by processes not yet known and add the necessary percentage of the concentrate to the finished lubricant.

OILINESS or film strength is that property which enables an oil to hold an unbroken film under heavy pressures and high temperatures between bearing and journal, to cling to a metal surface under severe conditions. Certain additives now used in motor oils serve to improve this characteristic of the oil. In this class of additives come the oxidized products of hydrocarbons, acids, ketones, etc., aluminum naphthenate, metallic salts of substituted fatty acids such as calcium phenyl stearate and homologues, halogenated esters of fatty acids, as chlordiphenyl and diphenyl oxide, tricresyl phosphate, and numerous other compounds.

Oiliness is considered by some technologists to be a property of the orientation of the oil molecule on the metal surface to be lubricated. An unbalanced molecule, such as a fatty acid, an unsaturated molecule such as aromatics or aromatic acids, certain inorganic derivatives of organic materials, and so on possess the property in varying degrees of attaching themselves more tenaciously to metal surfaces than do the more inert hydrocarbons. It is believed that this thin layer of "attached" molecules maintain the lubrication when conditions of operation break the oil film proper, and thus avoid scuffing and metal fatigue in bearing or journal. Unsaturated products show also this high film strength property, Gurwitsch, the great European chemist, pointed out.

That again tends to force a compromise in making lubricants. The

more unsaturated hydrocarbons of petroleum in general show the greater film strength and therefore make better lubricants so far as maintaining a film of oil in the bearing. Yet normally also the unsaturates are the least stable and have the lowest viscosity index, offsetting the oiliness advantage by the disadvantage of low oxidation stability and sludge-carbon deposition.

The most paraffinic types of molecules show the lowest film strengths; this does not mean that the so-called "paraffinic" oils are lowest in lubricating ability, since we have good reason to believe that these oils, such as the Pennsylvania type, contain few paraffins. The paraffinic hydrocarbon is most stable to oxidation, and in its chemical composition; therefore it tends to break down in service less than less stable unsaturates, naphthenes, and aromatics.

WE are also coming to use in the manufacture of motor oils additives which lower the pour point, by the addition of small percentages of protective colloidal materials, which prevent the hydrocarbons from crystallizing at low temperatures. The use of these products will likely increase although forming an extremely small part of the finished lubricant.

More important is the viscosity index improver. Pure hydrocarbons with viscosity index as high as 196 have been reported; such products cannot be made cheaply enough now, but may well form a part of lubricating oils in the next decade or two. One of the best methods to increase viscosity index is to add to oils a high molecular weight material made by polymerizing the light ends of gasoline, as is being done now commercially, we are told. Another product is made by combining, by a well known synthetic method, a light paraffin hydrocarbon with a very heavy aromatic or naphthenic one. For viscosity index improvement, that is, reducing the thinning-out property of an oil with rise in temperatures, synthetic chemistry will play a large part.

Summarizing; the best of lubricants of today are compromises, taking or accepting an undesirable property in some degree in order to improve a more desirable property. Lubrication technology trends toward the segregation of the several components of mineral oil, to choose and use those highest in the needed properties of high viscosity index, low pour point, high heat and oxidation stability, high film strength. These properties will be improved by synthetic products very high in certain properties.

The future lubricant will be an "assembled" oil, made up of concentrated natural and synthetic products, combined with additives which help to obtain the accentuated properties absolutely necessary to service the greatly increased speeds, temperatures and pressures in the automobiles to come.

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Knowing when to replace the oil filter cartridge is the key to success in filter operation. This Standard of Indiana station operator is showing a customer his badly sludged filter cartridge

Oil Filters

Their Claims are Exaggerated in Many Cases; Oil Companies Regard Their Use as Reducing Car Maintenance Cost by Providing Cleaner Engine Lubrication . . . .

OIL TECHNOLOGISTS are finding it rather difficult to stomach the claims of some of the oil filter manufacturers in behalf of their products. It is unfortunate that some filter makers insist that their filters are not only 100 per cent efficient, but that their use also make it unnecessary to change oil at all, even going the limit to claim that once the oil has passed through a certain filter it is a better oil than when originally placed in the crankcase.

This type of claim is unfortunate for those filter manufacturers who know the present limitations of the oil filter, for such statements weaken the position of all manufacturers of this type of equipment. Some makers, however, have the foresight to see the value of conservative claims of a nature that will warrant the confidence of oil company, car manufacturer, and motorist alike.

In spite of the strong temptation that must be felt by the filter manufacturers to publicize the fact that their equipment offers the saving of less frequent drain periods, there are some filter companies who have chosen a program of selling their product on a basis of clean engine lubrication, rather than fewer crankcase drainings.

Oil companies do not look upon such filter claims with a suspicious eye. In fact, the oil filter has found its way onto the fleet equipment, both passenger car and truck, of many oil companies. But in these cases the filter is not used to cut down the oil change periods, but rather to reduce the maintenance cost by providing cleaner engine lubrication.

The views of the oil industry on the subject of oil filters in the main, are favorable toward it, always keeping in mind the filter's limitations. One oil company lubrication engineer in the middle west gives the following opinion on oil filters:

"Oil filters in general are beneficial to the operation of internal combustion engines solely because of their ability to remove abrasive materials from the lubricating oil in an effective manner when they are properly serviced. The claims of most filter manufacturers as to the replacement period of the filter medium is grossly exaggerated. By this I mean that the 8000, 10,000, and 12,000-mile periods appear to be entirely too long, and should be reduced to a 2000 to 3000-mile interval.

"As a matter of fact, a really worthwhile filter would be one having an economical replacement unit to sell for about 25 cents and which would be replaced each time the crankcase oil is changed."

Such a practice, this engineer claims, would not only promote the sale of replacement units at a profit to the service station operator, but at the same time would keep the oil in a clean condition.

From the east a well known lubrication engineer employed by a large oil company reports that oil filters are used extensively on his company's equipment, and that examination of the filter contents has indicated that they retain large quantities of abrasive metal, from which he concludes "they must be doing some good".

Another oil company engineer in the middle west states that his company has tested many different filters, "and we all know that none of them are 100 per cent efficient in preventing contaminating materials from entering the oil and being circulated over the bearing surfaces".

Some filters, he points out, are much more efficient than others, but none has been discovered that could be termed 100 per cent efficient.

Continuing, this mid-western oil company engineer states; "The frequency with which the filtering elements of various filters become clogged with carbon, dirt, and other materials also varies widely, depending upon the chemical stability of the lubricating oil used, the mechanical condition of the engine itself, and the operating conditions".

These 1938 Cars Are Equipped With Oil Filters

Cadillac V-16	Nash
Chrysler	Packard
DeSoto	Pierce Arrow
Dodge	Plymouth
Graham	
Lincoln Zephyr	DeLuxe
Lincoln	Studebaker

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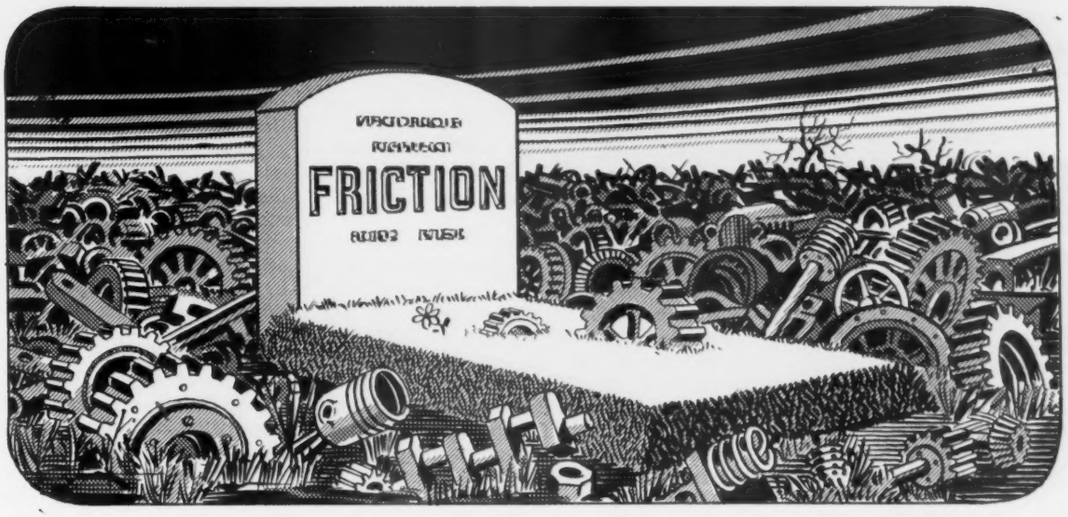

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This engineer believes that it would be very economical from the standpoint of increasing engine usage value if operators would combine the use of efficient air cleaners, efficient oil filters and reasonably frequent changes of crankcase oil, in order to approach the ideal in maintenance of a perfectly clean condition inside the engine.

The experience of one large oil company on the west coast has led it to the following conclusions in regard to oil filters, as expressed by one of the company's engineers:

"There is a definite place for oil filters and they may be operated to an advantage, as they will collect free carbon or road dust which accumulates in the crankcase and passes through the filter.

"However, we believe the automobile industry as a whole gives too much importance to what good oil filters will do in prolonging the life of motor oils; and the claims that are being made by automobile salesmen would not hold up in actual test. For example, some salesmen claim that oils can be run for periods as long as six months without draining when certain oil filters are used."

He points out that the reason oil drains are recommended frequently by his company is because of added crankcase dilution which has contaminated the original supply. He states that there is no oil filter he knows of that can take care of this condition, "and we don't expect to see one for the reason that a filter of this type would be a definite fire hazard and the automobile insurance companies would not allow it to be used".

He states that some filter companies are using a special chemically treated pad which will change the color of the oil, "but that that doesn't mean they are returning it to the original specifications".

Another engineer with a west coast oil company reports that he has observed a number of instances where stuck rings were encountered in engines equipped with oil filters, but he could not say definitely that the filters were in any way responsible for the trouble. He commented upon the tendency of the oxidation resistance of oils to decrease during service, pointing out that the use of filters does not seem to improve this condition.

Jumping across the continent to a well known lubrication engineer with an east coast oil company, we find the following comment on oil filters:

"No doubt it does have a certain value. However, varying temperatures, too long a period between drains, and no provision for control, are disadvantages. The oil is pumped over and over again through the same filtering arrangement, and it is quite obvious that with the speed and the continuity, plus the length of time, it cannot lay claim for a perfect job — no doubt it is effective for the first few hundred miles."

This engineer stated that he could cite instances of buses being operated over the usual mileage stipulated, where the filters had ceased to work even before the specified mileage had been reached.

From a filter manufacturer comes the suggestion that the oil companies, the engine builders, and the filter manufacturers get together regarding oil specifications and recommended changes. He would favor a committee from these three groups being formed for this purpose. This manufacturer has pointed out that his company has had to show many of the engine manufacturers how to design their engines to accomplish the desired results with the oil filter.

With the many claims that are currently being waved about by filter manufacturers, it might be well to consider the qualities that a good filter should possess. Prof. James I. Clower, of the Virginia Polytechnic Institute, in a paper on oil filters in fleet operation given before a Society of Automotive Engineers regional meeting in Baltimore last year, listed the desirable features of a good filter, as follows:

(1) It should remove all harmful impurities, including asphaltenes and the so-called colloidal carbon.

(2) It should be convenient to service without disturbing the oiling system.

(3) It should be adapted easily to all makes of engines.

(4) Its first cost and maintenance cost should be such that its use is economically justifiable.

(5) It should be reliable and present no oil-loss hazard.

(6) It should be capable of maintaining its efficiency for a comparatively large number of miles, say 5000, or over a considerable period of time.

(7) It should maintain an acceptable oil color for a reasonable period of operation.

(8) It should be sufficiently sturdy to withstand the rough service to which it is subjected in motor vehicle operation.

(9) The filtering element should possess characteristics such that it will not pack or channel.

(10) The volume of oil passing through the filter should be controlled so as not to wash back into the oil stream impurities collected.

(11) The construction should be such that the dirty oil cannot "short-circuit".

(12) The "sump" should be of ample size to collect the heavier solid impurities and water.

A good filter, Prof. Clower believes, should possess a "maximum number" of the aforementioned desirable features.

Like Prof. Clower, most automotive and lubrication engineers are not yet convinced that drain plugs should be eliminated from crankcases. With the improvement in filter construction, however, there is a growing tendency to recognize the filter as a medium that will benefit both the car manufacturer and the oil company by providing the motorist with cleaner engine lubrication and a resulting decrease in maintenance and repair costs.

Cleanliness is next to showmanship in the modern lubritorium. Note the modern equipment and the sales appeal which it radiates for a thorough lubrication job

Lubrication Equipment Vital In the Play for Profits

By **H. O. SCHRAMM***

FROM all indications 1938 is going to be a fast moving year. The entire world is moving along at an incredible rate, and for those who can stand the pace it promises to be an interesting ride. Business will increase for those service station operators who can keep pace with the times. Many of those who can't will fall by the wayside.

It is bound to happen that way because car owners are moving rapidly too, moving to modern service stations that are strictly up-to-date and keep abreast of the times with new and efficient equipment. The newer model cars need modern lubricating equipment and the car owner demands it. Not so much by word of mouth but by the mere fact that he invariably patronizes the location that is suitably supplied with all the necessary equipment to render automotive lubrication efficiently and quickly. No trade or business of any type can function without the proper tools peculiar to that business and those tools must be in good working order and must meet the new demands of modern business methods.

All of which means that the lubricating equipment that was very practical and efficient a few years ago may not fill the bill today. Therefore it behooves every service station operator, who intends to ride along on top during 1938, to take an inventory of his lubricating equipment. After that he should ask himself this question. "Have I got everything I need, so that I can, without exception, service all the lubricating requirements of any model of automobile which may drive into my place of business?" If the answer is in the negative that operator had better be doing something about it, and there is no time better than right now for the installation of new equipment. Then the station will be in a position to take advantage of all the lubricating business which is always available in the spring of the year.

*Automotive Lubrication Engineer, Shell Union Oil Corp., New York.

Types of Small Specialized Grease Guns Needed for Efficient Car Lubrication

1—Suction oil gun, for wet clutches, hydraulic shock absorbers.

2—Intermediate pressure gun, for wheel bearings.

3—High pressure gun, for water pumps.

4—Intermediate pressure gun, for Tryon shackles, oil type universal joints.

5—Intermediate pressure gun, for grease type universal joints.

6—Low pressure gun, for steering gears.

BY all the lubrication business is meant not only the so-called chassis job, but all those extra lubrication jobs which in the final analysis mean the difference between the station making a good net profit on its lubrication department and just breaking even. Extra jobs include among other things proper servicing or packing of the front wheel bearings, lubrication of the brake cables, shock absorbers, draining, flushing and refilling of transmissions, differentials, and crank-

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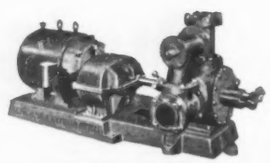

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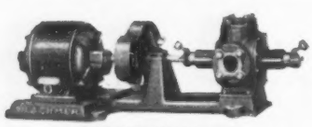

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Easy to turn—fast, positive action—capacities to 20 GPM. Ideal for pumping from drums or barrels, or mounted on small tank trucks. Suitable for handling any petroleum product from light oils to heavy greases. Spout tipped up so that liquid drains back after pumping. Same Automatic take-up for wear as BLACKMER Power Pumps.

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cases, cleaning and re-oiling of the air cleaners.

In addition, it should be remembered that lubrication service is the key which opens the door of increased opportunity for greater volume and profits on all other services and products which are offered, the combined total of which is the real balance wheel stabilizing the service station business. An attractive, properly equipped and managed lubrication department provides the best possible means for maintaining continuous customer contact which results in increased sales of tires, batteries, and accessories, in addition to the increases in petroleum products which are bound to occur.

Proper equipment is of major importance in securing this business. Not only is it conducive of good workmanship resulting in more efficient lubrication jobs, but it possesses greater eye appeal. Many motorists judge lubrication service largely by the equipment with which it is rendered. A lubrication department equipped with modern lubricators and tools cannot fail to give prospects an impression of neatness, thoroughness and dependability; it attracts new business and multiplies profits.

THE type of equipment in so far as lubricators or grease guns is concerned will depend to a large extent upon the amount of money that is available for this purpose; the size of the lubricating department and the volume of business that is anticipated. Equipment manufacturers bearing these variable factors in mind have designed various assemblies of equipment that will fit any purse or any size of lubritorium.

Of prime importance to any station are the grease guns or lubricators with which the station is equipped. No longer need these be of the type that constitute an eyesore, with working parts exposed so that in a short period of time they accumulate deposits of oil and dirt. Keeping step with the trend towards modernization, the manufacturers of lubricating equipment have restyled their respective lines of cabinet type lubricating units in gleaming baked enamel and all working parts are enclosed.

This idea lends itself to cleaner operating conditions, resulting in a neat, orderly lubricating department, which in itself attracts new customers to the station. Cabinet type lubricators can be purchased in single, portable units, or they can be secured permanently attached to a base. If it is desired to place equipment of this type between two lifts, it is advisable to take the permanently attached type. The single portable, cabinet models possess the advantage that additional units can always be purchased to build up the equipment of the lubricating department, which in most cases becomes necessary with an increase in volume of lubricating business.

Some of the equipment manufacturers have gone a step further in the de-

velopment of lubricators of the cabinet type by incorporating three units in one modernistic housing mounted either on a portable or permanent base. In some cases the original drums of lubricant are placed in position after opening one side of the housing which is hinged. A more recent innovation is to elevate the entire housing from the base by means of air pressure. It is claimed that this idea not only affords greater ease in inserting the drums in place but also prevents marring of the enameled housing. Both types come equipped with brackets fastened on the outside in which are placed the various hand guns for the specialized lubricants, such as wheel bearing lubricant, water pump grease, etc.

THE cabinet type of lubricators possesses certain very definite advantages over the older type of lubricating guns. In the first place they possess that eye appeal which today is necessary in all lines of merchandise. Secondly, they permit dispensing of lubricant from the original container which prevents contamination and wastage of products. In the third place, they eliminate the necessity of having drums of lubricants exposed to public view in the lubritorium, thereby detracting from the station appearance. Fourth, they speed up operations by eliminating the need for filling guns.

These cabinet type lubricators are generally available in sizes to fit 100-pound and 400-pound drums and one manufacturer will place on the market immediately a streamline model designed to hold 25 pound pails. This diversity in sizes permits any station to choose the type of lubricators that definitely suits its requirements. In all cases, although the cabinets are new, the mechanical principles and features, which have been developed over a period of years and which have been time tested, are virtually unchanged.

In addition to the lubricators mentioned, all of which will take care of the ordinary chassis fittings, the transmissions, and differentials, it is necessary that the station be provided with a set of small specialized guns which may be either hand or air operated. The air-powered gun sets provide the speed and convenience desired by all lubricating operators. The average service station will need a minimum of six guns for all the following applications:

1. Suction oil gun....Wet clutches, Hydraulic shock absorbers.
2. Intermediate pressure gun .... Wheel bearings.
3. High pressure gun .... Water pumps.
4. Intermediate pressure gun .... Tryon shackles, Oil type universal joints.
5. Intermediate pressure gun .... Grease type universal joints.
6. Low pressure gun .... Steering gears.

The above mentioned equipment will provide a fast, efficient and most practical method of rendering specialized

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lubrication service as recommended by all the car manufacturers.

Since the large scale adoption of the hypoid gear by motor car manufacturers another item of lubricating equipment has become indispensable to the modern lubricating department. That is a gear flusher which will adequately remove all of the old used hypoid gear lubricant from the differential housing. This is of vital necessity due to the fact that the mixing of unlike hypoid gear lubricants may react chemically with disastrous results.

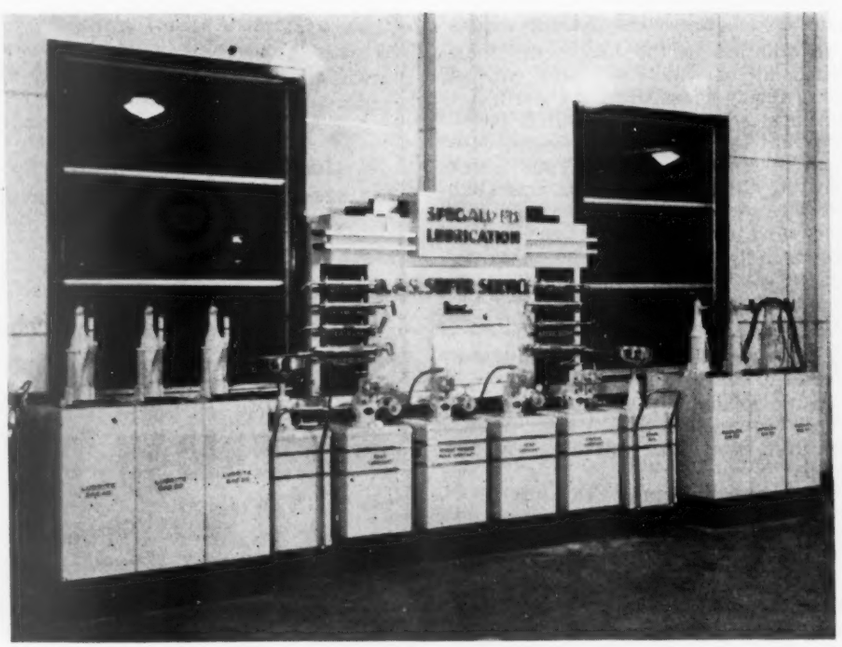
There are several different types on the market at the present time, most of which will do the job efficiently and conveniently. One type consists of two cylindrical chambers with hose and electrical connections, built into one compact unit. The upper tank, which is insulated, contains hot oil for flushing. The lower tank is the reservoir for the old oil. The unit is electrically heated with thermostatic control and operates on a vacuum-pressure system that sucks out the old oil and flushes with new oil in alternate operations.

Another self-contained unit for flushing gear cases with hot oil possesses the advantage of cutting down the air line pressure to 35 pounds which eliminates the possibility of bursting hose and the squirting of oil through the differential fill hole. In addition at this low pressure the operator has time to work the nozzle around in the housing to get the maximum benefits from the minimum quantity of hot oil. This particular type also possesses the ability to both force flushing oil into the housing and also to suck out any oil remaining in the gear case. Still another more inexpensive type of gear flusher has a separate unit for heating the flushing oil. It also operates on a vacuum-pressure principle and by reason of its low cost is finding ready acceptance by the trade in general.

One point that should be borne in mind is that some of the later model cars possess no drain plug or cap screws in the differential housing, so that it is advisable when purchasing a gear flusher to secure the type that operates on a vacuum-pressure system. Then the old gear lubricant can be sucked out of the gear case through the flusher.

Remember that hypoids may be a headache for the improperly equipped service station. Car manufacturers recommend periodical flushing at least every 5000 to 6000 miles. An efficient gear flusher eliminates profit-wasting methods and gives car owners a dependable satisfactory job.

One of the most profitable lubrication extra jobs which most service stations are passing up is the lubrication or packing of front wheel bearings. Previous to the past year wheel bearing assemblies were packed by hand and the results were not entirely satisfactory, due to the difficulty of making certain that each and every bearing, be it ball or roller, received its proportionate share of the lubricant. Now, however, several devices for scientifically packing front wheel ball and roller bearings have been introduced. Some of them operate by hand while at least one make has provision for air operation. They all possess a grease chamber from which the grease is forced under pressure into and on through the bearing assembly. When the escaping grease appears fresh and clean, the operator knows that all the



Not a hospital operating room, but a section of a well planned and well equipped lubritorium. The logical customer reaction here is to place implicit confidence in a job done with such modern equipment. This D. & S. Super Service, Inc., station is located at Springfield, Mass.

old lubricant has been forced out and the bearing assembly has been packed with new grease.

Another piece of equipment that is practically a necessity for the modern service station is a pit or lift jack which can be utilized to take the weight of the car body off the springs while the car is being lubricated. This device is useful in many different ways. In the first place, by taking the weight off the springs it permits spreading of the spring leaves so that a spring lubricant can be properly applied regardless of whether it is in the form of a spray oil or a heavy graphited grease such as is used for packing springs equipped with metal spring covers. Secondly, when cars are being lubricated on either a pit or a roll-on type lift, the front end can be jacked up so that the front wheels will spin clear thereby permitting lubrication of the front wheel bearings. In the third place, by removing the weight of the car body, chassis units, particularly on cars equipped with front end suspensions, become free, eliminating to a great extent "frozen" fittings. This promotes better, more certain lubrication of those units; prevents unnecessary wear on the lubricating equipment and saves the time customarily spent in fighting a tough lubricating point.

These jacks can be secured in several different types, some of which are manually operated while others are powered by air. The air-operated type, while more expensive, appears to be the most satisfactory in that it can be placed in operation more conveniently and is considerably faster than the hand jacks. In addition the air-operated jack is more compact, makes a better appearance and gives the motorist a better impression of modernized equipment.

Spring leaves on the modern automobile are coming in for a lot of attention insofar as their lubricating requirements are concerned and the service station operator who takes cognizance of this fact will reap the benefits of extra profits that will result from rendering this service. Most operators are familiar with the clamp type of spring lubricator which has been on the market for some time and realize it has been of material benefit in packing springs equipped with metal covers. Recently several new developments in spring lubricators have been placed on the market for eliminating spring squeaks not only in covered springs but also in the conventional open type spring.

One device of this type has a chisel-shaped spreader head which is inserted between the spring leaves by pulling together the long lever handles with which it is equipped. A grease gun packed with the proper type of lubricant is then attached to the fitting on the spring lubricator and the lubricant is shot directly between the spring leaves. The device is removed from the spring leaves by an outward pull on the handles. Another type of spring lubricator just being developed will operate by air pressure, again speeding up the operation.

Those stations that have the knowledge and are capable of rendering lubrication service on shock absorbers and brake cables will find these items extremely profitable provided they are equipped with the necessary tools and adapters to do the job as it should be done. Without this equipment only certain of the cars on the road can be serviced and it certainly is not conducive to good business to service these requirements on a few cars and advise the drivers of others that you are not in a position to take care of them.

Today it is necessary to merchandise your lubrication department. One way to do this is by creating in it a new, modern atmosphere conducive to increased sales. New customers are met and old patrons contacted most frequently in the lubrication department. That is why such little details as appearance and equipment are really of such great importance.

When a car owner comes into a lubricating department, he usually requires one service. In the proper environment he can usually be sold two or three times as much. Modernization of a lubricating department costs very little in relation to the increase in service profits which will result. Modernization starts, of course, with the installation of modern equipment which will correctly and efficiently service the lubricating requirements of the modern automobile.

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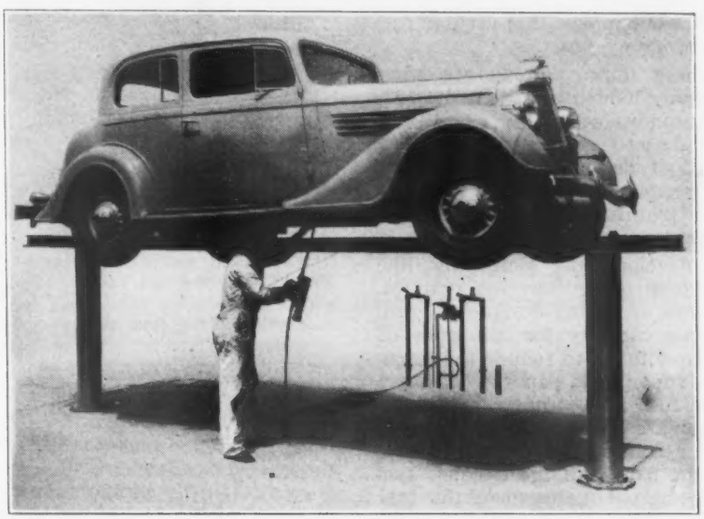

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Fuel and Oil Economy Achieved in '38 Models

By JOHN W. THOMPSON
N. P. N. Staff Writer

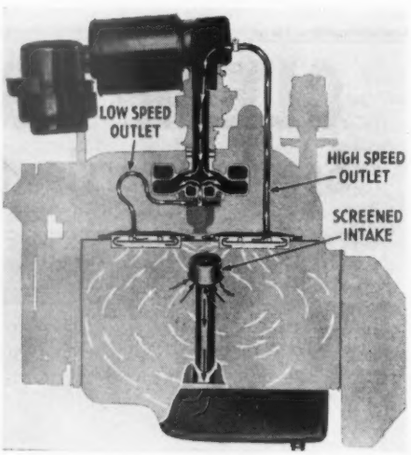
WITH THE INTRODUCTION of new car models every year the general public bestows its favor upon such things as streamlined design, new type ash trays, novel speedometer dials, and the many other items of a new car which attract the layman's eye.

They hear the salesman's ever-present story of more power, more pick-up, greater speed, and greater fuel and oil economy, but the critics are few who can look under the hood of the modern automobile and discover, for example, what makes this greater fuel and oil economy possible.

But these improvements are present in many hidden places in the 1938 cars. Automotive engineers are continually developing new devices, gadgets and designs which will permit their sales and advertising departments to truthfully spread the gospel of greater economy.

Some developments along this line have become quite standard practice. Fuel pumps are being designed to provide ample capacity for all types of driving conditions, to reduce the possibility of vapor lock. In the majority of cases, fuel lines from the tank to the pump are located on the outside of the car frame and on the opposite side of the car from the exhaust system. In a great many cases the fuel line goes around the front of the engine to the pump and carburetor, a feature which places it directly in the cool air stream. All of these features are to prevent vapor lock.

In the Buick carburetor the main discharge jet and the idle feed tubes are jacketed with cool gasoline and a thick insulating gasket is used between the carburetor and manifold. A hole is located in the engine support directly ahead of the fuel pump to allow air from the fan to contact the pump.



The crankcase ventilation system used on the 1938 Cadillac V-8 and LaSalle. Two crankcase outlets are provided, one leading to the intake manifold, and the other through a pipe to the air cleaner. These are provided for open and part-throttle operation

Buick uses two oil rings for each cylinder, which are constructed with wide oil slots to prevent them from choking up after high mileage. Gasoline consumption on the new Buicks is held in check by the use of an automatic heat control and vacuum advance, as well as by the use of straight through, resonance type mufflers of a large capacity which reduce back pressure.

Another new Buick development is the turbulator piston with a beveled head which controls burning of the fuel and permits higher compression pressure without spark knock.

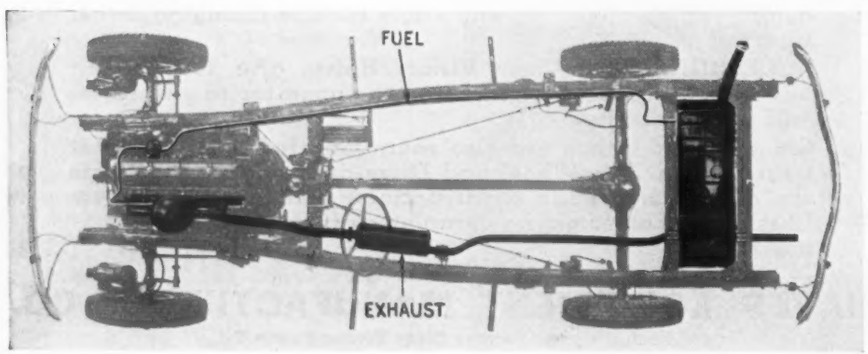
Hudson and Terraplane continue with their principle of dual carburetion, claiming that the resulting more even distribution of fuel to the cylinders provides five additional horsepower and 10 per cent better economy.

In order to reduce any vapor lock tendency, DeSoto has adopted an inverted fuel pump which incorporates a higher discharge pressure as well as an increased vapor handling capacity. For cooler operation, this pump is located at a greater distance from the exhaust manifold and more in the air stream.

PLYMOUTH offers two separate groups of fuel economy equipment, either of which may be ordered optionally from the factory. Group No. 1 consists of a special intake manifold and carburetor of one inch normal size, and a change in rear axle ratio. In addition to this equipment, Group No. 2 consists of manifold heat shields and throttle stops limiting the speed to 45 or 50 miles per hour.

Oldsmobile is equipped with a vacuum fuel saver designed to increase gasoline economy during part throttle operation. The vacuum control operates in combination with centrifugal weights. On quick acceleration or with wide open throttle, there is insufficient vacuum to operate the vacuum control so the spark is retarded to the partial degree of advance provided by these centrifugal weights. This eliminates the spark knock that would occur with a fully advanced spark, yet insures sufficient advance for maximum performance. As the engine picks up in speed and there is no pull on it, the vacuum increases and automatically advances the spark to its maximum position, where it allows the engine to produce added power from the gasoline used.

The Oldsmobile fuel pump is inverted from its conventional position and located low on the engine so that the fuel bowl extends beneath the en-



This Chevrolet chassis shows the general design adopted in regard to location of the fuel line in order to eliminate vapor lock. Note that the fuel line from the tank to the pump is on the opposite side of the frame from the exhaust system, and that the line from pump to carburetor passes in front of the engine and directly behind the fan to provide additional cooling

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- Sells 2 carloads of tires in 6 stations (Wyaconda, Mo.)
- One-stop station sells tires to truckers at rate of $100 a month in town of 750 people.
- 25% Ahead, and still 2 months to go. (Bismark, N. D.)
- Greets customers by name—builds repeat business.
- $10 daily quota from lube lifts, oils and car cleaning to meet expenses. (Quincy, Ill.)
- Helping stations to sell—demonstration with magnet brings oil changes. (Crafton, Pa.)

Are you posted on recent developments to regulate retail marketing? For example:

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- 3 states require license tax on pumps.
- 8 states require grading of gasoline sold within their limits.

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gine pan directly in the path of the outside airstream, thus bringing about a definite reduction in the gasoline temperature at the pump.

An anti-percolating device is built into the Oldsmobile carburetor, and consists of a vertical by-pass connecting the float chamber with the main fuel passage. This prevents forcing the fuel from the carburetor due to boiling and reduces hard starting.

The overdrive is still popular on a number of cars for 1938. It contributes to fuel and oil economy by its ability to reduce engine speed without reducing road speed. The automatic transmission used optionally on the Oldsmobile Six and Eight and on the Buick 40 offers a similar type of saving in its fourth gear where the ratio is 3.55 to 1.

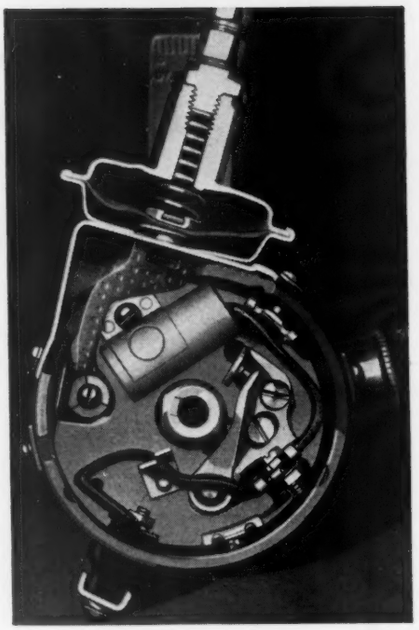
Chevrolet, following its 1937 design, uses an especially shaped combustion chamber which burns fuel efficiently with a minimum of heat loss. Other Chevrolet features which contribute to greater fuel economy are: Proper heating of the inlet manifold for all driving conditions; improved distribution of fuel in the inlet manifold, so that each cylinder does its share of the work; carburetor calibration which gives full power at wide open throttle, and still provides economical operation on normal level road driving; and a vacuum spark control and octane selector for securing maximum results with all commercial fuels.

Taper-faced piston rings aid in reducing oil consumption on the new Chevrolet. Round cylinder bores, which provide a minimum of distortion when hot and tin-plated iron pistons which allow a very close fit without scoring, also contribute to a reduction in oil consumption.

On the LaSalle and Cadillac V-16, an effort to obtain more gasoline economy is made by a more accurate fuel-to-air ratio calibration, and on the Cadillac V-8 a vacuum actuated economizer is used. Instead of the former economizer operated by the throttle, this is now actuated by vacuum, the mixture thus being enriched whenever power is required, even though the throttle is not fully opened. With the new construction, the economizer action increases the fuel flow at small manifold depressions, thus enriching the mixture whenever the engine is pulling regardless of throttle position. This change makes it possible to use a leaner mixture for light load operation with a resultant fuel economy improvement.

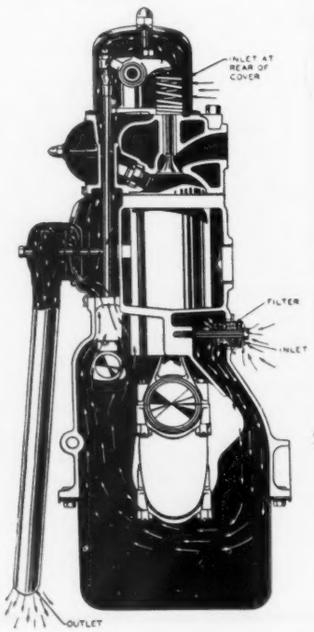
Cadillac engineers state that oil economy is primarily a matter of piston speed and general design. An outstanding example of low piston speed is the new Cadillac V-16 engine which has a piston travel of 1590 feet per mile. This compares with an average piston travel of perhaps 2200 feet per mile, according to Cadillac.

The ventilating systems used on the



Oldsmobile's vacuum fuel saver makes possible a greater degree of spark advance under part throttle operation and improves gasoline economy through the entire speed range. It is a vacuum control operating in conjunction with the conventional centrifugal weight control

Cadillacs and LaSalles are of the engine suction type which this company finds more reliable than the road suction type. Two crankcase outlets are provided, one leading to the intake manifold. This provides suction during part-throttle operation. Another outlet is through a pipe leading to the air cleaner above the carburetor. Whenever the throttle is opened and the inlet manifold vacuum falls, the flow of air through the air cleaner increases. By an injector action on



Buick's crankcase ventilating system

the crankcase ventilator outlet the increased air flow causes a suction in this pipe, thus providing a compensating action which insures adequate ventilation under all conditions of speed and load.

It is claimed that the Cadillac and LaSalle radiator shutters indirectly improve oil economy by preventing cold air from striking the engine crankcase and that this prevents or reduces moisture within the engine, thus reducing the frequency of oil drain periods.

On the Studebaker, the carburetor automatic choke is set to give the correct mixture for starting and warm-up. Tests made by Studebaker reveal that less gasoline is used with this setup than with a manually operated choke in the hands of the average driver. With an improvement in the manifold hot spot and control, the duration of choking has been cut down considerably. In order to accomplish this a new heater for the thermostatic element has been developed. A tube of special alloy to withstand high temperature is inserted through the exhaust manifold directly in the path of the hot exhaust gases. The result is a quick heat for the choke thermostat.

Studebaker claims that the use of the overdrive, cutting down engine speed, nearly doubles the oil mileage. The three-ring piston is still being used by Studebaker. The heat dam in the piston and the top ring location in the position normally used for the second ring keep the first ring at a lower and more uniform temperature. Tests have shown a large gain in oil mileage consistently, according to Studebaker engineers, who state that less wear is found on the top ring.

Two cars, Studebaker and Lincoln-Zephyr, have increased oil drain frequency recommendations to every 5000 miles, due to the adoption of oil filters. Many other cars, although equipped with filters, have not made such a drastic change in oil drain periods.

The entire fuel line of the new American Bantam car is of synthetic rubber which acts as a heat insulator. Fuel consumption in this car has been reduced by the high compression ratio of 7 to 1 and by the elimination of accelerating pump and air cleaner. It is claimed that the accelerating pump is unnecessary on a manifold of the Bantam's size if the bends are properly designed to prevent puddling. Bantam engineers claim that air cleaners are a continual source of trouble because of variations in resistance as they accumulate dirt, leading to inconsistent fuel metering.

Oil consumption on the Bantam has been reduced by the use of a combination splash and jet lubrication system. The quantity of oil supplied by the jets is automatically adjusted for viscosity changes by the proper selection of the diameter-to-length ratio of the jet. It is explained that this procedure was feasible because the discharge co-efficient of an orifice with zero length would not be affected by viscosity changes, while an orifice with a small diameter compared to the length would have a flow almost proportional to the diametrical viscosity of the liquid.

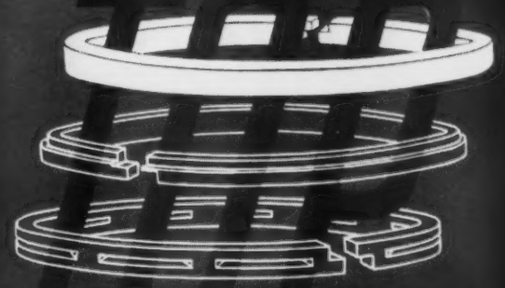
1937 Car Production Slightly Below 1929

NEW YORK — The 1937 output of American automobile companies is estimated at 4,975,000 units, of which 4,050,000 are classified as passenger cars and the remaining 925,000 as motor trucks, according to a recent announcement of the Automobile Manufacturers Assn.

The industry's output last year was the second highest on record, according to the statement, being exceeded only by the 1929 production total of 5,621,715 cars and trucks.

The association reports that not only were there more vehicles in use in the U. S. last year than ever before, but that highway travel, as measured by gasoline consumption figures, also set a new record.

It is pointed out that the absorption of more than 4,000,000 new vehicles by the domestic market during 1937 resulted in increasing the total number of vehicles owned in the U. S. to a new all-time peak of 29,650,000 units, of which 25,400,000 are passenger cars.



Lubrication

It has been stated that cylinder bore wear falls generally into three classifications: (1) abrasion; (2) erosion; (3) corrosion. ❖ The first of course is caused by road dust, metal chips, dirt, etc., and has been greatly aided by the oil bath air cleaner.

Erosion is caused by metal-to-metal contact. And it is here that "dag" colloidal graphite can play an important part. The graphoid surface formed on the friction parts withstands the temperatures and pressures existing in the combustion zone. It presents a tough, lubricating film which will resist erosion and at the same time help maintain the oil film. The graphoid surface, being almost a part of the metal, cannot drain off the friction parts. This fact assures its presence during cold starts - a time when most scuffing of piston rings and bores occurs.

Corrosion is caused by the oxidation or chemical reaction of the products of combustion on the piston rings, cylinder walls, and pistons. Here again, the graphoid surface plays an important part. Being chemically inert and covering as it does the friction areas, it serves as a retardant of these corrosive influences.

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Some Facts Regarding Its History, Accomplishments, And Future Aims

IN THE FACE of a growing tendency on the part of car manufacturers toward widening crankcase drain periods, the oil industry is shaping an organized plan to shackle this trend and to hold it within reasonable limits.

For almost two years, the oil industry's representative in this effort has been the Committee on Oil Change Practice, a group of 13 oil technologists headed by W. H. Correa, Socony-Vacuum Oil Co., Inc., who have contributed liberal portions of their time and funds to evolve an oil-change plan that would be agreeable to the oil industry and the automobile industry.

Early in 1936, this oil-change committee began work to gather into a simple report, understandable to any motorist, the basic reasons for frequent and periodic oil changes. At that time the oil industry began to sense the trend among car manufacturers to widen the span of oil changes. In the fall of 1936, when Studebaker announced to the public its filter-equipped engine which required an oil change ony twice a year, the efforts of the committee were continued with renewed vigor.

With a plan of recommended crankcase oil-change practice, the committee, late in 1936, presented it to the oil industry for approval. As was expected, this approval of the plan by the oil industry was forthcoming. But the committee also wanted the approval of a responsible voice in the industry, to add prestige and weight to its recommendations. With this in mind, the plan was presented to the American Petroleum Institute for an additional backing and blessing.

It was submitted to the Automotive Advisory Committee of the institute, and upon the recommendation of that group, was approved by the institute's executive committee on Jan. 22, 1937. The institute made it quite plain that, while it had given its approval to the oil change committee's plan, it was not sponsoring the movement.

During the past year the institute has co-operated by distributing over 30,000 copies of the committee's oil change recommendations to A.P.I. members. These in turn have been widely reprinted and distributed by individual oil companies among their organizations. The committee's report has been used by sales crews of many oil companies as a means of educating dealers on the need for frequent oil drains.

THROUGHOUT the past year, the oil change committee has made repeated contacts with the sales and engineering staffs of the car manufacturers, in an effort to get the automotive industry to follow the committee's recommendations in their car owner instruction books and service literature to car dealers. Individually inscribed brochures were presented to each car manufacturer by the committee, outlining in a complete fashion the committee's objectives, and including a complete text of the oil change recommendations of the committee.

In a foreword to the brochure, the committee presented this message to car manufacturers:

"The American Motorist, the American automobile industry, and the American petroleum industry are three completely interdependent parts of a single institution. Each part has its individual interests and problems, but all three have one outstanding interest in common—namely, that every American motor car shall perform as efficiently and economically as possible throughout its normal life.

"The individual car owner's share in this interest is obvious. That of the automobile and petroleum industries is different, but quite as natural. For, the extension of the automobile market, and the extent to which any single automobile is used—increasing the rate of consumption of both petroleum and automotive products—are both directly stimulated by economy of operation.

"Lubrication is a common interest in

point. While lubrication problems are initially the proper concern of the industry supplying lubricants, their ultimate solution, by their nature, must rest in co-operation between the lubricant and machine suppliers, and in acceptance by the users of those machines.

"The Automotive Advisory Committee of the American Petroleum Institute recently received from a Committee on Oil Change Practice a recommendation bearing the approval of more than 90% of the Petroleum industry, entitled: 'Recommended Practice for Crankcase Oil Change in Passenger Motor Cars.'

"These recommendations were presented to the American Petroleum Institute and approved by the Executive Committee on January 22, 1937.

"It is natural that these recommendations should be initiated by the Petroleum Industry. Before they are given to the motoring public, however, we feel it vital that the Automobile Industry concur with, and endorse, them.

"These recommendations carry a key to increased production for the investment of the American motorist, protection for the resale value of the used cars which are such an important portion of every automobile dealers's business, and other significant elements of protection for the dealer's business welfare.

"They are submitted for your interest and approval in a spirit of co-operation, to the end that there may be no 'working at cross purposes' in striving toward the common goal of both our industries—to make it easier for more to drive, and for every American motorist to drive more."

Prior to the introduction of the 1938 cars in the fall of 1937 it had become apparent which way the car manufacturers were making the oil-change wind blow.

With many of the 1938 instruction books showing oil drain periods being stretched from 200 to 500 per cent over 1937, the committee's original oil change recommendations of every 500 miles during winter and every 1000 to 1500 miles during summer presented a problem that had to be met by the oil industry.

With some advance knowledge of the car manufacturers impending oil change recommendations for 1938 and the immediate need for stemming this growing tide of wider and wider crankcase drain periods, the oil change committee met at Atlantic City in Sept., 1937, during the National Petroleum Assn. convention.

Behind closed doors, the committee discussed its newest problem—the car manufacturers 1938 oil drain recommendations. Out of this meeting came a feeling that a more co-operative attitude could be adopted in dealing with the automotive industry. Also out of this meeting came immediate plans to contact the car manufacturers with the suggestion that they drop from their recommendations entirely any reference to specific mileage intervals for oil changes, leaving these recommendations to the oil companies.

This plan has been carried to the principal 1938 oil change "offenders", including Studebaker, and all General Motors and Chrysler officials, and while the suggestion came too late for adoption in 1938, the committee looks toward 1939 with eager eyes. According to the committee, the car owner instruction books might more effectively devote space to an explanation of what constitutes good engine lubrication, and leave to the oil companies the responsibility of judging when each car needs an oil change.

At the committee's Atlantic City meeting was born the idea of creating a bureau within the oil industry to prepare and distribute educational material on proper oil change procedure to the motoring public. A sub-committee of three, headed by F. E. Whitesell, Socony-Vacuum Oil Co., Inc., is now at work evolving a promotional and educational program to enlighten the American motorist on the necessity of frequent oil changes. When this plan is evolved it will be presented to the Committee on Oil Change Practice for further consideration.

The committee's Recommended Practice For Crankcase-Oil Change is again published in connection with this article, because of the many excellent sales arguments it offers the service station operator for selling frequent oil changes to his customers. National Petroleum News was the first oil trade paper to publish these recommendations, in its Sept. 23, 1936 issue; but, because of the importance of the subject, these recommendations are republished herewith.

Recommended Practice for Crankcase-Oil Change in Passenger Motor Cars

WINTER

The severity and duration of cold weather, the number of engine starts in a given period, and the amount of idling largely govern the rapidity with which crankcase oil becomes contaminated in winter.

For cars operating at temperatures below freezing, oil should be drained **at least every 500 miles.**

Where atmospheric temperatures consistently below 10 deg. F. are encountered, and cars are operated on short runs with many stops and starts or with prolonged idling, draining should be on a time rather than a mileage basis. Under such conditions, oil should be changed at least every two weeks.

When temperatures below zero are consistently encountered, crankcase temperatures may be abnormally low, Under such extreme conditions, the oil may become dangerously contaminated and require draining after a few days' use.

SUMMER

The frequency of summer draining depends largely upon car speed, atmospheric temperature and the rapidity with which dust and other contaminants accumulate in the crankcase.

In general, crankcase oil should be changed every 1000 to 1500 miles, the interval depending upon the severity of operating conditions.

Cars driven at sustained high speeds in hot weather should be drained at least every 1000 miles. The same recommendation applies for cars operated on dusty roads.

Where dust storms are encountered, crankcase oil should be drained immediately after leaving the dust area, regardless of mileage. Air cleaners also should be cleaned thoroughly at the same time. When cars are operated regularly in dust areas, the crankcase oil pan should be dropped and cleaned frequently.

Under the most favorable conditions, a car may be driven safely as much as 1500 miles before draining. However, it should be realized that abrasive dust is always present, and that gradual contamination of crankcase oil is always taking place.

While cars are occasionally driven further without

apparent damage, the saving in oil cost per year is too small to be considered in comparison with the possible sacrifice in engine protection and efficiency.

Reasons for Crankcase-Oil Changes

The essential reasons for changing crankcase oil may be stated as follows:

1. Water contamination: It is a fact, not commonly known, that more than a gallon of water is produced in an engine by the burning of one gallon of gasoline. This water is ordinarily in the form of vapor or steam; but, when the jacket-water temperatures are low, some of this water condenses and gets into the crankcase.

This condition is accentuated by low air temperatures, and becomes extremely rapid in sub-zero weather. It is particularly acute when short runs and frequent starts are necessary, as in the case with cars used by physicians, inspectors, and salesmen. The same applies to motorists who use their cars only for going to and from work.

Under these conditions, while the jacket-water temperature may reach a normal range, the crankcase remains cold, and water in it is not driven off by evaporation.

For winter operation, this accumulation of water is the major factor in oil deterioration, because, almost invariably, it mixes with the oil to form a thick, mayonnaise-like emulsion. Leakage of anti-freeze solution from the cooling system into the engine greatly accentuates the formation of emulsions. These often interfere with normal lubrication, leading to disastrous results.

During the cold period of every winter, a large number of cases are encountered in which bearings, pistons, and cylinder walls are ruined because the lubricating systems become clogged by emulsions. Serious damage also has occurred from water freezing in crankcases when cars are left standing exposed to low temperatures.

Winter operating conditions also tend to promote dilution of crankcase oil by unvaporized fuel. In intermittent service, automatic chokes may remain in operation during the entire run so that rich mixtures are fed to the engine, thereby causing excessive dilution.

The efficiency of electrical systems is always lower in cold weather. Battery output is much reduced, resulting in slower cranking. Ignition efficiency is impaired by decreased battery voltage and by fouled or incorrectly adjusted spark plugs, thus causing incomplete combustion and frequent misfiring. Such failures of the electrical system to function at high efficiency will result in unburned fuel working into the crankcase to cause excessive dilution of the lubricating oil.

2. Dust: Dust is always present in the atmosphere. The accumulations of dust on the body of the car and on the oily surfaces of the engine are a rough indication of this. Dust storms, detours, country roads, and road shoulders are all major sources of dust. Even in cities, the dust content of the air is appreciable, as public-health-department records show that a dust fall of from one to four tons per square mile per day is not unusual in American cities.

Ordinarily, from 3 cubic feet to 27 cubic feet of air per minute is forced through engine crankcases to ventilate them. This is small compared to the amount of air which passes through the carburetor into the cylinders. For the average car under normal driving conditions, this amounts to approximately 100 cubic feet per minute. Since crankcase ventilators do not normaly have effective aid-cleaning equipment, and as most carburetor air cleaners are not on the average more than 50 per cent efficient, considerable quantities of dust enter the engine undr ordinary oprating conditions.

Dust is a very active abrasive, and always promotes wear. In extreme cases it has been known to ruin engines completely in less than 1200 miles of operation.

Oil filters seldom provide adequate protection against wear from dust or other contaminating materials. Only a small proportion of the oil in circulation passes through them; they clog rapidly, and are often ineffective over a considerable portion of the period during which they are in service.

3. Oil contamination: Under normal operating conditions, oil undergoes gradual chemical change in contact with air and the metals in the engine. These changes result in the development of products which may in time result in damage to bearings, cylinder walls, wrist pins, and other delicately-finished surfaces in the engine, if such contaminated oil is allowed to remain in the crankcase too long a period.

Chemical changes leading to the development of these contaminating substances are accelerated by the presence of the contaminating substances themselves, in exactly the same way that one rotten apple in a barrel soon leads to the destruction of the remaining good fruit. Accumulation of these contaminants, either in the oil itself or as deposits in crankcases or oil filters, seriously endangers the stability of the lubricant.

Protracted use of lubricating oil too frequently entails the development of non-lubricating substances which increase engine drag, promote excessive carbon formation, and may result in stuck rings, clogged oil screens, and ultimately in total failure of the lubricating system and ruinous damage to the engine.

4. The amount of these various contaminants in crankcase oil depends upon the distance or time a car is operated and upon operating conditions. As the quantity of these substances in crankcase oil can only be determined by laboratory analysis, which is not practical for the average car owner, his only safe method of assuring engine protection and efficiency is to drain oil at sufficiently frequent intervals to prevent dangerous contamination.

* * *

The points discussed above indicate why regular oil changes are important. The intervals at which such changes should be made will depend on the operating conditions prevailing. It is obviously impracticable to give a detailed recommendation which will cover the particular conditions under which each individual car is operated. It is, however, possible to set a practice which will provide a sufficient margin of safety for the wide range of conditions known to be encountered by the average automobile. This practice has already been stated above.

The Cost of Draining Crankcase

The oil cost of frequent crankcase changes is extremely small compared with the cost of repairing damages resulting from faulty lubrication. For example, if a car with a five-quart crankcase capacity consumes one quart of oil every 500 miles, then in 7500 miles of operation (roughly the annual operation of the average passenger car) 43 quarts will be used if changed every 1000 miles, 35 quarts if changed every 1500 miles, and 31 quarts if changed every 2000 miles. Even if oil is changed only once a year, 19 quarts will be used.

For the everage motorist, the yearly cost resulting by decreasing the draining period from 1500 to 1000 miles is less than two and one-half dollars ($2.50). Further extension of the draining period results in only a fraction of this amount as additional saving.

On the other hand, even the simplest repair operation made necessary by faulty lubrication will wipe out any savings made by extending the draining period, and the extensive repairs made necessary by neglect to drain as recommended will cost many times any possible saving through extending the draining period.

Three New Gear Lubricants *that do the work of SIX*

Sinclair has developed and is marketing three new and improved products—Opaline Gear Lubricants AX, BX and CX—which greatly benefit service station operators by simplifying gear lubricating practice, and reducing inventory requirements. These three lubricants do the work that formerly required six. They also serve more adequately the mechanical requirements and advanced refinements in gear design.

With the new Opaline lubricants and Sinclair Extreme Duty Hypoid Lubricant, station operators can have a compact group of only four lubricants which meet the requirements of cruising gears, free wheeling, over drives, dual-ratio gearing and all types of transmissions and differentials.

This is merely one more example of Sinclair leadership which makes the handling of the Sinclair line so advantageous to distributors, jobbers, and dealers. The Sinclair brands, covering a wide range of petroleum products for all purposes, have national recognition for highest quality.

For full details phone the nearest Sinclair office, or write Sinclair Refining Company (Inc.), 630 Fifth Avenue, New York, N. Y.

SINCLAIR

COMPRESSION RATIOS

Of 1938 Cars Average 6.30 to 1

The average compression ratio of the 47 principal passenger car models in 1938 is 6.30 to 1, a slight increase over the average 1937 compression ratio of 6.27 to 1. This 1938 ratio does not include the 7 to 1 ratio of the new American Bantam.

A sizable increase in compression ratio is found in all 1938 Buick engines. The Buick 40, formerly with a 5.7 to 1 ratio, is now 6.15 to 1, while the remaining 1938 Buicks have a 6.35 to 1 ratio, as compared to a 5.75 to 1 in 1937.

The Cadillac V-16 engine has boosted its compression ratio .8 of a point, and is now 6.8 to 1. The Nash LaFayette, formerly with a compression ratio of 5.61 to 1, is now boosted to 5.83 to 1, while the Nash engine's compression ratio is up to 6 to 1, from a former 5.67 to 1. Slight increases are also noted in the Packard Six and Eight engines.

Decreases in compression ratios are found in the Ford V-8 "85", Studebaker Eight, and the Chrysler Six and Imperial. From a former compression ratio of 6.3 to 1, the Ford "85" is lowered to 6.12 to 1. Studebaker, formerly 6.5 to 1, is now 6 to 1, and the two Chrysler models have been jumped to a 6.2 to 1 ratio.

Aside from the American Bantam, the highest compression ratio noted on the 1938 engines is the Cadillac V-16's 6.8 to 1 ratio.

The general average 1938 piston displacement is 271.3 cubic inches, as compared to 269.4 cubic inches in 1937. The 1938 figure does not include the American Bantam, with a displacement of 45.6 cubic inches, which, if averaged, would reduce the 1938 figure somewhat. Increases in piston displacement are found in 1938 on the Chrysler Six and Imperial, Graham, Packard Six and Studebaker Six. Decreases appear on the Cadillac V-16. Ford, Chevrolet, and Plymouth have the same piston displacements as in 1937.

Compression Ratios and Maximum Horsepower Ratings of 1937 and 1938 Passenger Cars

Make and Model	1938 Compression Ratio St'd.	1938 Compression Ratio Opt.	1937 Compression Ratio St'd.	1937 Compression Ratio Opt.	1938 Brake Max. H.P.	1938 Horsepower R.P.M.	1937 Brake Max. H.P.	1937 Horsepower R.P.M.	1938 Piston Displacement (Cubic inches)	1937 Piston Displacement (Cubic inches)
Buick 40	6.15	.....	5.70	...	107	3400	100	3200	248.0	248.0
Buick 60	6.35	.....	5.75	...	141	3600	130	3400	320.2	320.2
Buick 80	6.35	.....	5.75	...	141	3600	130	3400	320.2	320.2
Buick 90	6.35	.....	5.75	...	141	3600	130	3400	320.2	320.2
Cadillac V-8 60	6.25	5.75	6.25	5.75	135	3400	135	3400	346.0	346.0
Cadillac V-8 65, 70	6.25	5.75	6.25	5.75	135	3400	135	3400	346.0	346.0
Cadillac V-8 75	6.70	5.75 to 6.25	6.25	5.75	140	3400	135	3400	346.0	346.0
Cadillac V-12	...	.....	6.00	5.65	...	....	150	3600	....	368.0
Cadillac V-16	6.80	.....	6.00	5.65	175	3600	185	3800	431.0	452.0
Chevrolet Master 6	6.25	.....	6.25	...	85	3200	85	3200	216.5	216.5
Chevrolet DeLuxe 6	6.25	.....	6.25	...	85	3200	85	3200	216.5	216.5
Chrysler 6	6.20	7.10	6.50	7.00	95	3600	93	3600	241.5	228.1
Chrysler Imperial	6.20	6.50 to 7.40	6.70	...	110	3400	110	3600	298.6	273.8
Chrysler Cust. Imperial	6.50	.....	6.50	7.45	130	3400	130	3400	323.5	323.5
DeSoto	6.50	.....	6.50	7.00	93	3600	93	3600	228.1	228.1
Dodge	6.50	.....	6.50	...	87	3600	87	3600	217.8	217.8
Ford V-8 60	6.75	.....	6.75	...	60	3500	60	3500	135.9	135.9
Ford V-8 85	6.12	.....	6.30	...	85	3800	90	3800	221.0	221.0
Graham 6—85	...	.....	6.80	...	...	....	70	3500	....	169.6
Graham 6—95	6.70	.....	6.70	...	90	3600	85	3300	217.8	199.1
Graham 6—116 Supercharged	6.70	.....	6.70	...	116	4000	106	4000	217.8	199.1
Graham 6—120 Supercharged	...	.....	6.70	...	...	....	116	4000	....	217.8
Hudson 6	6.25	7.00	6.25	7.00	101	4000	101	4000	212.0	212.0
Hudson 8	6.25	7.00	6.25	7.00	122	4200	122	4200	254.5	254.0
Hupmobile 6	5.75	.....	...	...	101	3600	...	....	245.3	....
Hupmobile 8	5.80	.....	...	...	120	3600	...	....	303.2	....
LaSalle V-8	6.25	5.75	6.25	5.75	125	3400	123	3400	322.0	322.0
Lincoln-Zephyr	6.70	.....	6.70	...	110	3800	110	3900	267.3	267.3
Lincoln V-12	6.38	.....	6.38	...	150	3400	150	3400	414.0	414.0
Nash LaFayette	5.83	.....	5.61	5.88	95	3400	90	3400	234.8	234.8
Nash Amb. 6	6.00	.....	5.67	...	105	3400	95	3400	234.8	234.8
Nash Amb. 8	6.00	.....	5.64	...	115	3400	105	3400	260.8	260.8
Oldsmobile 6	6.10	.....	6.10	...	95	3400	95	3400	229.7	229.7
Oldsmobile 8	6.20	.....	6.20	...	110	3600	110	3600	257.1	257.1
Packard 6	6.52	7.05	6.30	6.75	100	3600	100	3600	245.3	237.0
Packard 8	6.60	7.05	6.50	7.00	120	3800	120	3800	282.1	282.0
Packard Super 8	6.50	7.05	6.50	...	130	3200	130	3200	320.0	320.0
Packard 12	6.40	6.0 to 7.0	6.40	6.0 to 7.0	175	3200	175	3200	473.0	473.0
Pierce Arrow 8	6.40	.....	6.40	...	150	3400	150	3400	385.0	385.5
Pierce Arrow 12	6.40	.....	6.40	...	185	3400	185	3400	462.0	462.0
Plymouth 6	6.70	7.00	6.70	...	82	3600	82	3600	201.3	201.3
Plymouth DeLuxe 6	6.70	7.00	6.70	...	82	3600	82	3600	201.3	201.3
Pontiac 6	6.20	.....	6.20	...	85	3520	85	3520	222.7	222.7
Pontiac 8	6.20	.....	6.20	...	100	3700	99	3800	248.9	248.9
Studebaker 6	6.00	.....	6.00	...	90	3400	90	3400	226.0	217.8
Studebaker Com. 6	6.00	.....	...	...	90	3400	...	....	226.0	....
Studebaker Pres. 8	6.00	.....	6.50	...	110	3600	115	3600	250.4	250.4
Terraplane 6	6.25	7.00	6.25	7.00	96	3900	96	3900	212.0	212.0
Terraplane DeLuxe 6	6.25	7.00	6.25	...	101	4000	96	3900	212.0	212.0
Willys	5.70	.....	5.70	...	48	3200	48	3200	134.2	134.2
AVERAGE	6.30	7.52	6.27	6.84	111.6	3545	110	3458	271.3	269.4

New Equipment

AND THE MANUFACTURERS

CHAMPION ASSIGNMENTS—Permanent assignments for six Champion Spark Plug Co. representatives who have just completed special field training courses were announced this week by Sales Manager Ralph Rowland.

The following were listed: L. R. Craig to New Orleans, P. F. Wiechman to Fort Wayne, Ind.; M. M. Mayer to Indianapolis, R. V. Bennett and A. E. Kraus to Chicago and M. E. Orme to Portland, Ore.

* * *

RESEARCH DEPARTMENT—Newly created Market Research and Development Departments of Continental Can Co. have been placed in charge of H. A. Goodwin, advertising manager for the company, according to F. G. Searle, vice president in charge of sales.

* * *

NEW GREASE DISPENSER—A new type combination grease package and dispensing unit, known as the "GunKan," has been announced by the American Oil & Grease Corp., Chicago.

The capacity of the package is three pounds, and the contents can be placed directly into the gear case without the aid of a can opener, extra gun, or air pressure, according to the company.

A spout or tube is inside the can, and when the customer wishes to use it he pulls out this spout as far as it will go. By turning it to the right it locks with a plunger or disc which lies on top of the grease inside the can. A flange on the spout's end prevents the spout from entering the differential too far.

With hand pressure on the bottom of the "GunKan," the company states that all or part of the contents can be transferred into the gear case.

* * *

NEW MANIFOLD—A new selector manifold for use on multi-compartment tank trucks is announced by Ralph N. Brodie Co., Oakland, Cal. It is designed for gasoline or fuel oil trucks having two or more compartments. An automatic signal arrangement "flags" the open line and shows the "grade" name of the product delivered.

The primary purpose of the manifold is said to be to prevent the accidental opening of more than one compartment at a time. It also saves space as it takes the place of separate compartment valves and simplifies piping and manifolding arrangements. The manifold can also be furnished without the "flags". Illustrated bulletin on request to the factory or any branch office.

* * *

NEW LUBRICATOR — U. S. Air Compressor Co., Cleveland, announce their new Silver Scout Lubricator. This unit is portable and has a new pump, (patent applied for) which has only one seal and consists of a Nitralloy

rotary air valve. It holds the original 25 pound grease container furnished by oil companies. Finished in royal blue with three chrome bands which act as a bumper, the lubricator comes in two models, with or without hand guns.

* * *

WATER-LOCKING VALVE — Several new styles and sizes of water-locking valves are described in a new catalog just released by the Viele Valve Corp., Elmira, N. Y. The company claims that it has a foot valve or plain unit to suit every individual preference, and announces that it has also extended the use of its valves into bulk plants, tank trucks, and aircraft refueling, in addition to the regular service station use.

* * *

NEW OFFICE—A. O. Smith Corp., Milwaukee, has opened a district office in Pittsburgh, in the Gulf Bldg., with R. L. Howes in charge.

Howes has had broad experience as a mechanical engineer in the petroleum and allied industries. For several years he was with Fairbanks, Morse & Co. in the southwest, among other duties handling their oil field business through the Continental Supply Co. He later devoted his entire time to sales work in the diesel engine division of this company. The past three years he has been eastern manager of diesel engine sales for the Worthington Pump & Machinery Corp.

* * *

NEW FEDERAL TRUCK PRESIDENT — Raymond W. Ruddon has been elected president of the Federal Motor Truck Co., Detroit, succeeding M. L. Pulcher who has resigned his post as head of the company since its formation in 1911. Ruddon was formerly vice president and general manager. Pulcher is retiring from active business.

* * *

HAYES REORGANIZATION—New ownership and management of the Hayes Equipment Mfg. Co., Wichita, Kans., has been announced. Officers of the reorganized company are: J. T. Cronkhite, president; Dr. D. I. Maggard, board chairman; Roy Streeter, vice president; and A. F. McMaster, secretary and treasurer.

This company, one of the pioneers in the bulk and service station equipment field, has recently introduced a new model computing pump.

The newly reorganized Hayes company is a consolidation of the Clear Vision Pump Co. and the old Hayes company.

* * *

LUBRICHART BOOK—To its complete line of car lubrication charts, the Lubrichart Co., Cleveland, announces its new lubrication specification book which includes, not only the charts, but a generously illustrated "Information Supplement" containing facts and information on lubrication.

According to the company, the opening 26 pages of the book are devoted entirely to helpful lubrication information, including such material as, every day problems, a detailed discussion of often-missed lubrication points, as well as complete information on the subjects of water pumps, air cleaners, oil filters, springs, and many other items.

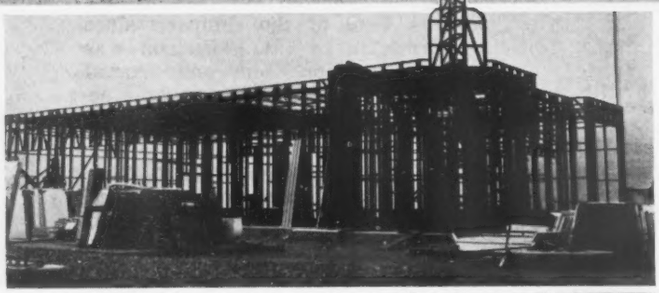
The balance of the book is devoted to complete model coverage from 1934 through 1938. Lubrichart also announces a complete line of wall charts covering passenger car and truck capacities, and lubricant recommendations.

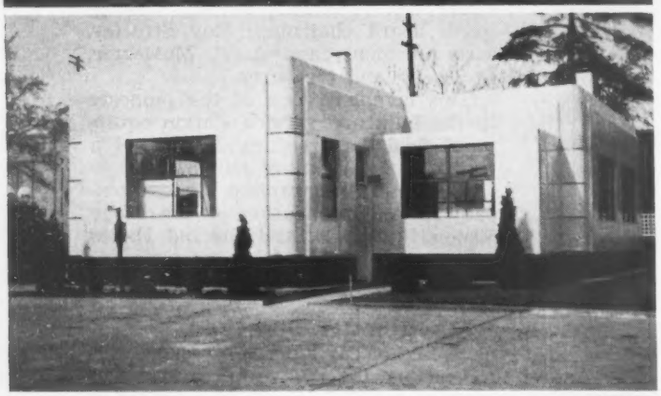
* * *

EDWARDS WITH COLONIAL SUPPLY—N. D. Edwards, formerly on the business staff of NATIONAL PETROLEUM NEWS at Cleveland, has recently been appointed to the sales staff of Colonial Supply Co., Pittsburgh, and will represent this company in the northern Ohio district.

Edwards is also assisting in covering the Ohio territory for Anco Electrolite Products, Cleveland, makers of mirrored reflectors for station floodlighting.

Photo courtesy of The Texas Co.





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Buildings of quality, noted for Exceptionally Low Maintenance—Low Illuminating Cost—Increased Sales Appeal.

General office

DRESSER ENGINEERING COMPANY
TULSA, OKLAHOMA

Representatives in,
New York City, Pittsburgh, St. Louis, Shreveport, Houston, Ellwood City, Mexico City.

Photo courtesy of Mid-Continent Petroleum Corp.

Markets

At A Glance . . .

MID-CONTINENT: Lubes unsettled; gasoline quiet.

PENNSYLVANIA: Neutral oil and gasoline prices lower.

MID-WESTERN: Kerosine scarce as demand continues heavy.

EASTERN SEABOARD: Gasoline and kerosine quiet.

GULF COAST: Cargo trading light as tanker rates advance.

CALIFORNIA: Japanese buyers in market again.

Mid-Continent

Lubes Unsettled

N. P. N. News Bureau

TULSA, Jan. 10.—Interest in the Mid-Continent centered on lubricating oils and efforts of manufacturers to keep inventories below the danger line. Shipments were reported light. Two Mid-Continent manufacturers have shut down their lube plants. Another reported discontinuing production of neutral oil. Generally, offerings of lubes were at unchanged prices, although unconfirmed reports of price shading were continued to be heard.

Wax prices were slightly lower. Inquiry for natural gasoline for coastwise and export shipment was reported somewhat brisker last week. At least one part cargo was sold. Grade 26-70 prices were unchanged.

While some improvement in refined gasoline orders has been reported, overall demand for motor fuel has been disappointing to most refiners. Shipments to contract and local customers made up the bulk of movement from the Mid-Continent. Prices generally were unchanged.

Kerosine was closely held by most refiners. One or two said they were short and buying in the open market.

Pennsylvania

Neutral Oils Drop

N. P. N. News Bureau

CLEVELAND, Jan. 10.—All grades of Pennsylvania neutral oils dropped 1.5 cents per gallon last week as refiners lowered prices to move stocks expected to be consumed in winter motor oils.

Contrary to seasonal trend, 200 No. 3 neutral has declined 7.5 cents since Sept. 1 from 24.5 cents. The 150 neutral has dropped from 20 cents to 15 cents.

U. S. Motor gasoline continued downward and was offered in large quantities at 4.625 cents the past week. The 65 octane gasoline also was down 0.125 cent. Several marketers attributed the price declines to the shortage of benzol for blending.

White crude scale wax declined 0.05 cent per pound following a 0.1-cent drop the previous week.

Cylinder stocks prices were unchanged but a generally improved position was reported by nearly all refiners. Bright stocks were steady. Kerosine and 36-40 fuel oil continued to find a ready market, although some sellers reported supplies were available in slightly larger quantities for spot shipment.

N. P. N. Refinery Index

The Refinery Index shown below is the calculated average return from refining a barrel of 36 gravity Mid-Continent crude into its various principal products at the current price of crude oil. The index indicates the following margins in cents per barrel between cost of crude and current selling price of products.

Date	Margin
Jan. 3	32.8
Month ago	39.8
Year ago	32.8

N.P.N. Gasoline Index

	Dealer T.w. Cents per	Tank Car gal.
Jan. 10	10.19	5.97
Month ago	10.29	6.06
Year ago	10.21	6.30

Dealer index is an average of "undivided" dealer prices, ex-tax, in 50 cities.

Tank car index is a weighted average of 13 wholesale markets for regular-grade gasoline.

Mid-Western

Kerosine Scarce

N. P. N. News Bureau

CHICAGO, Jan. 10.—The Mid-western gasoline market continued quiet the past week, sellers reported. Some Chicago marketers acknowledged slight improvement in higher octane gasoline toward the end of the week, however.

Michigan straight run gasoline moved fairly well early in the week with easier trend reported as the week ended.

A shortage of kerosine was reported throughout the week by Chicago sellers. Range oil and prime white distillate were substituted for kerosine in many instances to meet the demand.

Michigan refiners also reported demand for kerosine was in excess of supply.

Range oil continued in good demand in Illinois and Michigan and offerings were said to be limited.

Eastern

Gasoline Quiet

N. P. N. News Bureau

NEW YORK, Jan. 10.—Gasoline and kerosine markets along the Atlantic seaboard were extremely quiet the first week of the new year.

Some distributors in the New York Metropolitan area reported gasoline consumption was somewhat below expectations. While temperatures in this area have been normal, roads have been clear and the weather fairly good for motoring.

Elsewhere along the coast, demand for gasoline has been about normal, according to sellers' reports here.

Coastal

Cargo Trading Quiet

NEW YORK, Jan. 10.—The Gulf Coast cargo market was quiet the first week of 1938, according to sellers here.

Current tanker rates, which traders said advanced nearly 5 cents per barrel in the past week, were credited with being responsible for the absence of domestic movement.

Other sellers said that easiness of gasoline was responsible for the lack of foreign buying. They expressed the opinion that lower prices at the Gulf would result in a resumption of foreign takings. Late Jan. 8 unconfirmed re-

REFINERY TANK CAR MARKETS

All prices on this page are publisher's opinion of open market quotations or sales, for spot shipment (10 to 15 days). Prices in cents per gallon, except heavy fuel oils in dollars per barrel, tank car lots, f.o.b. refineries in districts designated, except where otherwise noted. Inter-refinery and export prices not included, unless so stated in the respective markets. Federal, state or municipal taxes not included. Prices quoted apply on products made from legally produced crude. Unless otherwise noted, gasoline octane ratings are determined by C.F.R. Motor method, A.S.T.M. D-357-33T; and lubricating oil specifications determined according to A.S.T.M. methods, unless otherwise noted.

Gasoline *and* Naphtha

Prices Effective	Jan. 10	Jan. 3
OKLAHOMA		
U. S. Motor: (Octane Test L-3)		
62 oct. & below	4.00 – 4.25	4.00 –4.25
63-66 oct.	4.375– 4.50	4.375 –4.50
67-69 oct.	4.625– 4.875	4.625 –4.875
70-72 oct.	4.875– 5.25	4.875 –5.25
60-62, 400 e.p.	(a)4.00 –4.25	(a)4.00 –4.25
64-66, 375 e.p.	(a)5.00 –5.125	(a)5.00 –5.125
68-70, 350-360 e.p.	(a)5.125–5.25	(a)5.125–5.25
WESTERN PENNA.		
Bradford-Warren:		
Motor gasoline:		
Min. 65 oct.	6.75 – 7.25	6.75 – 7.00
Other districts:		
54-56 naphtha	(a)4.625	4.875
Motor gasoline:		
U. S. Motor (58-62°)	4.625– 4.875	4.75 – 5.00
Min. 65 oct.	6.625– 7.125	6.75 – 7.25

CENTRAL MICHIGAN (Prices f.o.b. Cent. Mich. refinery group basis, for shipment within Michigan. Shipments, however, may originate at plants outside Central group).

Str.-Run Gasoline	(d)5.25 –5.50	(d)5.25 – 5.50
64-66 octane gas	7.75 – 8.00	7.75 – 8.00
68-70 octane gas	8.125– 8.50	8.125– 8.50

(d)Excluding Detroit shipment.

CALIFORNIA (3c tax to be added to prices if used in state)

U. S. Motor:		
54-58, for instate shipment	7.50 – 9.25	7.00 – 9.25
54-58, for outside state shipment	8.00 – 9.00	8.00 – 9.00
58-61, 375-400 e.p., 65 oct. & above	8.75 – 9.75	8.75 – 9.75

(e)N. TEX. (For shipment to Texas and N. Mex. destinations; Group 3 prices quoted on northern shipments).

U. S. Motor: (Octane Test L-3)		
62 oct. & below	(a)4.50 –4.875	(a)4.50– 4.875
63-66 oct.	(a)5.00 –5.375	(a)5.00– 5.375
67-69 oct.	(a)5.375–5.75	(a)5.375– 5.75
70-72 oct.	(a)5.625–6.00	(a)5.625– 6.00
60-62, 400 e.p.	(a)4.625–4.875	(a)4.625–4.875
KANSAS (For Kansas destinations only)		
U. S. Motor: (Octane Test L-3)		
62 oct. & below	4.375– 4.50	4.375– 4.50
70-72 oct.	5.375– 5.50	5.375– 5.50
(c)W. TEX.		
U. S. Motor: (Octane Test L-3)		
62 oct. & below	4.625– 4.75	4.625– 4.75
63-66 oct.	5.125– 5.25	5.125– 5.25
67-69 oct.	5.50 – 5.625	5.50 – 5.625
70-72 oct.	5.875	5.875
(c)E. TEX.		
60-62, 400 e.p.	(a)4.125–4.25	(a)4.125–4.25
N. LA. (For shipment within La. & into Ark.)		
U. S. Motor: (Octane Test L-3)		
62 oct. & below	4.50 – 4.75	4.50 – 4.75
63-66 oct.	4.625– 4.875	4.625– 4.875
67-69 oct.	5.00 – 5.25	5.00 – 5.25
70-72 oct.	5.50	5.50
ARKANSAS (For shipment within Ark. & into La.)		
U. S. Motor: (Octane Test L-3)		
62 octane & below	(b)4.50	(b)4.50
67-69 oct.	(b)5.00	(b)5.00
OHIO (Quotations of S. O. Ohio. Delivered anywhere in Ohio).		
U. S. Motor	7.625	7.75
Above 65 oct.	7.875	8.00

Natural Gasoline

(Prices are those to blenders on freight basis shown below. Shipments, however, may originate in other Mid-Continent manufacturing districts, such as Panhandle Texas, S. W. Texas or Kans.)

Prices Effective	Jan. 10	Jan. 3
F.O.B. GROUP 3		
Grade 26-70	3.00	3.00

(a)Nominal.
(b)Only one refiner quoting.
(c)Refiners report they generally receive from 0.25c to 0.5c per gal. more for gasoline & kerosine for local or differential territory shipment.

Prices Effective	Jan. 10	Jan. 3
Natural Gasoline (Cont'd)		
F.O.B. BRECKENRIDGE		
Grade 26-70	3.00	3.00
CALIFORNIA (F.o.b. plants in Los Angeles basin)		
75-85, 350-375 e.p. for blending	7.50 – 7.75	7.50 – 7.75

Kerosine

WESTERN PENNA.		
Bradford-Warren:		
45 w.w.	5.50 – 5.75	5.50 – 5.75
46 w.w.	5.625– 5.875	5.625– 5.875
47 w.w.	5.75 – 6.00	5.75 – 6.00
Other districts:		
45 w.w.	5.375– 5.50	5.375– 5.50
46 w.w.	5.50 – 5.625	5.50 – 5.625
47 w.w.	5.625– 5.75	5.625– 5.75

CENTRAL MICHIGAN (Prices f.o.b. Cent. Mich. refinery group basis, for shipment within Michigan. Shipments, however, may originate at plants outside Central group.)

47-49 w.w.	5.55 – 5.80	5.55 – 5.80
OKLAHOMA		
41-43	4.125– 4.375	4.125– 4.375
42-44 w.w.	4.25 – 4.625	4.25 – 4.50
KANSAS (For Kansas destinations only).		
41-43 w.w.	4.50 – 4.625	4.50 – 4.625
42-44 w.w.	4.625– 4.75	4.625– 4.75
(c)N. TEX. (For shipment to Texas and New Mexico destinations; Group 3 prices quoted on northern shipments).		
41-43 w.w.	4.50	4.375– 4.50
(c)E. TEX.		
41-43 w.w.	(a)4.00 –4.125	(a)4.00 –4.125
N. LA. (For shipment within La. and into Ark.)		
41-43 w.w.	4.50 – 4.625	4.50 – 4.625
ARK. (For shipment within Ark. and into La.).		
41-43 w.w.	(b)4.625	(b)4.625
CALIFORNIA		
40-43 w.w.	6.00 – 7.00	5.75 – 7.00

Gas *and* Fuel Oils

WESTERN PENNA.		
Bradford-Warren:		
36-40	5.25 – 5.375	5.25 – 5.375
Other districts: (Excluding Pittsburgh District Prices).		
36-40	4.875– 5.00	4.875– 5.00

CENTRAL MICHIGAN (Prices f.o.b. Cent. Mich. refinery group basis, for shipment within Michigan. Shipments, however, may originate at plants outside Central group.

P.W. Distillate	5.50 – 5.75	5.25 – 5.50
No. 3 gas oil, str.	4.75 – 5.25	4.75 – 5.00
U.G.I. gas oil	4.625– 4.875	4.625– 4.875
Fuel Oils (Vis. at 100):		
500-700 Vis.	2.625– 2.875	2.50 – 2.875
300-500 Vis.	3.00 – 3.25	3.00 – 3.25
100-300 Vis.	3.25 – 3.375	3.25 – 3.375
OKLAHOMA		
No. 1 white	4.125– 4.25	4.125– 4.25
No. 1 straw	4.125	4.125
No. 2 straw	3.875– 4.00	3.875– 4.00
No. 2 dark	3.75 – 3.875	3.75 – 3.875
U. G. I. gas oil	(a)3.00 – 3.375	(a)3.00 – 3.375
28-30 zero	3.625– 3.75	3.625– 3.75
28-30	(b)$1.35	(b)$1.35
24-26	(b)$0.875-0.925	(b)$0.875-0.925
18-22	(a)$0.825- 0.875	(a)$0.825-$0.875
14-16	(a)$0.80-$0.85	(a)$0.80-$0.85
KANSAS (For Kans. destinations only)		
No. 1 p.w. fuel oil	4.375– 4.50	4.25 – 4.50
10-14 fuel oil	$0.675 –$0.70	$0.70 –$0.725
N. TEX. (For shipment to Texas and N. Mex.; Group 3 prices quoted on northern shipments).		
No. 1 white	(a)4.25	(a)4.25
U. G. I. gas oil	2.75 – 2.875	2.75 – 2.875
24-26	$0.85 –$0.875	$0.85 –$0.875
18-22	$0.80 –$0.825	$0.80 –$0.825
N. LA. (For shipment within La. and into Ark.)		
No. 2	3.625– 3.75	3.625– 3.75
20-24	$1.10 –$1.15	$1.10 –$1.15
16-20	$0.95 –$1.00	$0.95 –$1.00
10-14	$0.80 –$0.85	$0.80 –$0.85
ARK. (For shipment within Ark. and into La.)		
No. 2	(b)4.00	(b)4.00
28-30 gas oil, zero	(b)3.75	(b)3.75
CALIFORNIA		
San Joaquin Valley		
Heavy fuel	$0.60 –$0.85	$0.60 –$0.85
Light fuel	$0.85 –$0.95	$0.85 –$0.95
Diesel fuel (per gal.)	3.75 – 5.00	3.75 – 5.00
Stove dist. (per gal.)	4.00 – 7.00	4.00 – 7.00
Los Angeles		
Heavy fuel	$0.65 –$1.00	$0.65 –$1.00
Light fuel	$0.85 –$1.10	$0.85 –$1.10
Diesel fuel (per gal.)	3.50 – 5.00	3.50 – 5.00
Stove dist. (per gal.)	3.75 – 7.00	3.75 – 7.00

Prices Effective	Jan. 10	Jan. 3
Gas and Fuel Oils (Cont'd		
San Francisco:		
Heavy fuel	$1.05	$1.05
Light fuel	$1.15	$1.15
Diesel fuel (per gal.)	5.50	5.50
Stove dist. (per gal.)	7.50	7.50

Note: All above heavy fuels meet Pacific specification 400; light fuel, spec. 300; Diesel fuels, spec. 200; and stove distillate, spec. 100.

Neutral Oils

WESTERN PENNA.

Viscous Neutrals (Viscosity at 70° F.)

200 Vis. (180 at 100°) No. 3 col., 420-425 fl.:		
0 p.t.	20.50 –21.00	20.50 –21.00
10 p.t.	19.50 –20.00	19.50 –20.00
15 p.t.	19.00 –19.50	19.00 –19.50
25 p.t.	17.00 –17.50	17.00 –17.50
180 Vis. (165 at 100) No. 3 col., 410-415 fl.:		
25 p.t.	16.00 –16.50	16.00 –16.50
150 Vis. (143 at 100) No. 3 col., 400-405 fl.:		
0 p.t.	17.50 –18.00	17.50 –18.00
10 p.t.	16.50 –17.00	16.50 –17.00
15 p.t.	16.00 –16.50	16.00 –16.50
25 p.t.	15.00 –15.50	15.00 –15.50

SOUTH TEXAS

Vis. Color		
Pale Oils: (*Vis. at 100° F.; p.t. 0*		
100 No. 1½-2½	5.00 – 5.50	5.00 – 5.50
200 No. 2-3	6.75 – 7.25	6.75 – 7.25
300 No. 2-3	7.25 – 7.75	7.25 – 7.75
500 No. 2½-3½	8.25 – 8.75	8.25 – 8.75
750 No. 3-4	8.75 – 9.25	8.75 – 9.25
1200 No. 3-4	9.25 – 9.75	9.25 – 9.75
2000 No. 4	9.50 –10.00	9.50 –10.00
Red Oils:		
200 No. 5-6	6.75 – 7.25	6.75 – 7.25
300 No. 5-6	7.25 – 7.75	7.25 – 7.75
500 No. 5-6	8.25 – 8.75	8.25 – 8.75
750 No. 5-6	8.75 – 9.25	8.75 – 9.25
1200 No. 5-6	9.25 – 9.75	9.25 – 9.75
2000 No. 5-6	9.50 –10.00	9.50 –10.00

Note: South Texas red oil prices shown above cover oils with green cast; blue cast red oils are slightly lower in some cases.

MID-CONTINENT (Vis. at 100° F.; F.o.b. Tulsa basis).

(0 to 10 P.P.)

Vis. Color		
Pale Oils:		
60-85—No. 2	5.50	5.50
86-110—No. 2	6.00	6.00
150—No. 3	9.00	9.00
180—No. 3	10.00	10.00
200—No. 3	10.50	10.50
250—No. 3	11.50	11.50
280—No. 3	12.50	12.50
300—No. 3	13.00	13.00
Red Oils		
180—No. 5	9.00	9.00
200—No. 5	9.50	9.50
250—No. 5	10.50	10.50
280—No. 5	11.50	11.50
300—No. 5	11.75	11.75

Note: Viscous oils, 15-25 p.p., generally are quoted 0.5c under 0-10 p.p. oils. Non-viscous oils, 15-25 p.p., generally are quoted 0.25c under 0-10 p.p. oils. Viscous oils (150-300 vis.), No. 4 color, generally are quoted 0.5c above No. 5 color oils.

CHICAGO (Vis. at 100° F.)

Pale Oils (e)0 to 10 p.p.:		
Vis. Color		
60-85—No. 2	7.25	7.25
86-110—No. 2	7.75	7.75
150—No. 3	10.00	10.00
180—No. 3	11.00	11.00
200—No. 3	11.50	11.50
250—No. 3	12.50	12.50
Red Oils		
180—No. 5	10.00	10.00
200—No. 5	10.50	10.50
250—No. 5	11.50	11.50
280—No. 5	12.50	12.50
300—No. 5	12.75	12.75

(e)Viscous oils, 15 to 30 p.p. are quoted 0.5c lower, 60-85 and 86-110 No. 2 non-viscous oils, 15 to 30 p.p., are quoted 0.25c lower. To obtain delivered prices in Chicago, add 0.25c per gal.

Cylinder Stocks

MID-CONTINENT (F.o.b. Tulsa basis)		
Bright Stocks:		
190-200 Vis. at 210° D	19.00	19.00
150-160 Vis. at 210° D:		
0 to 10 p.p.	16.00	16.00
10 to 25 p.p.	15.00	15.00
25 to 40 p.p.	15.00	15.00
150-160 vis. at 210° E	15.00	15.00

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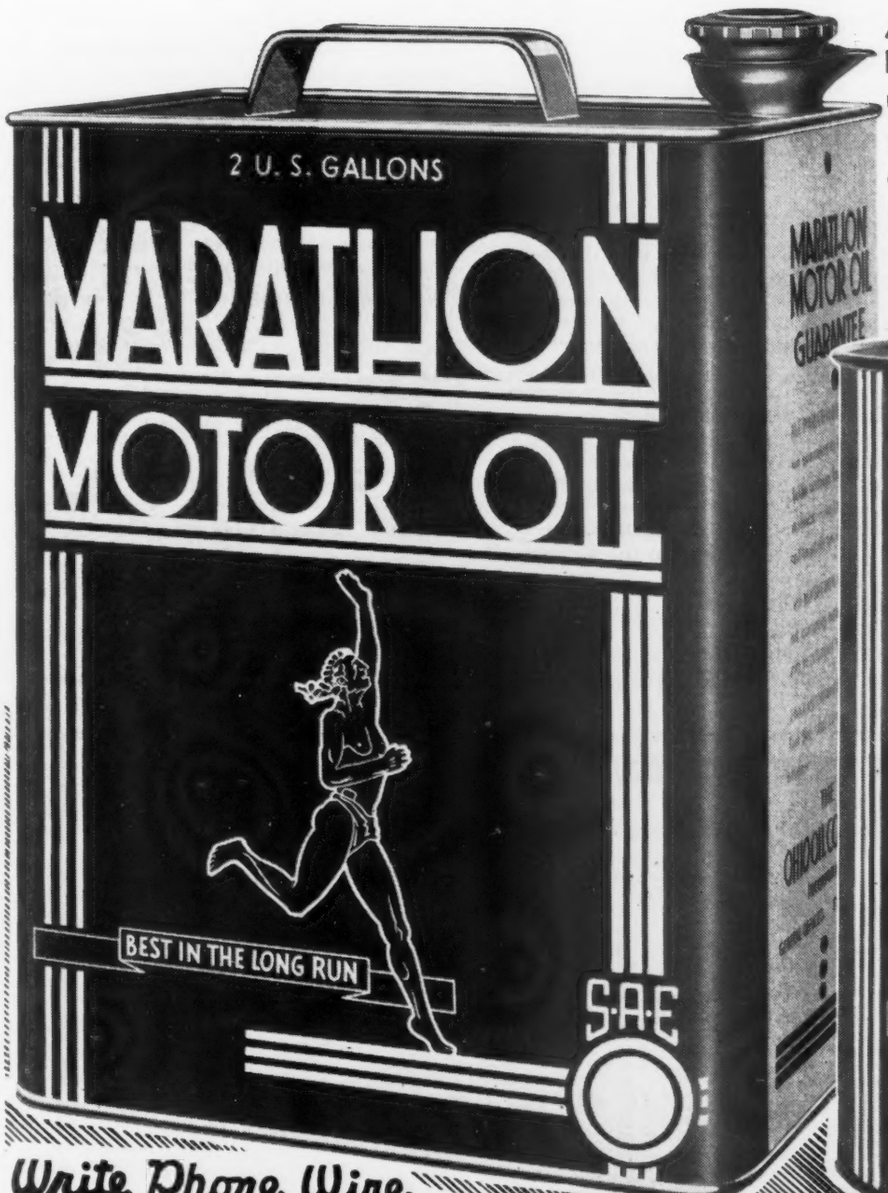
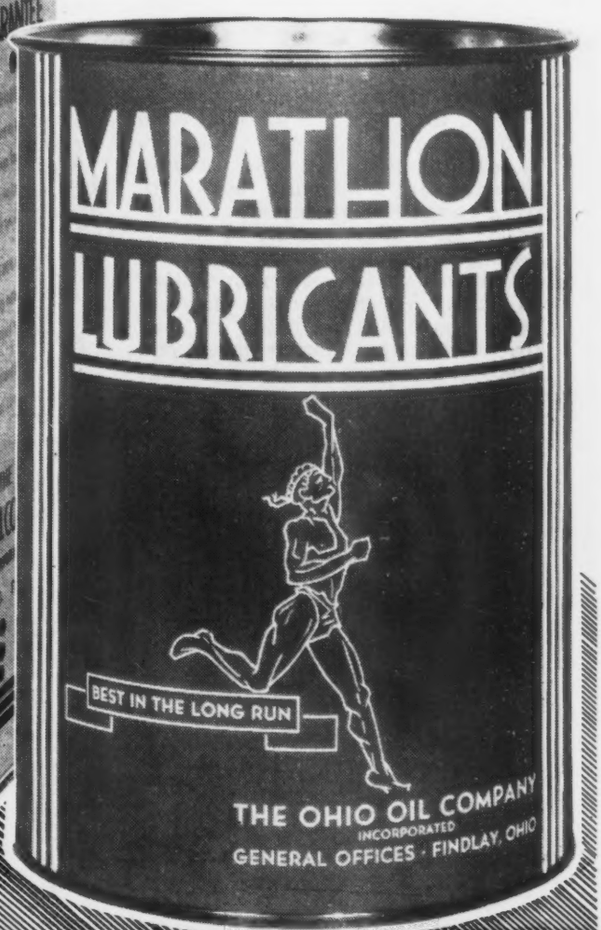




Write Phone Wire for complete particulars

THE OHIO OIL COMPANY

GENERAL OFFICES - - - FINDLAY, OHIO

ports were that a considerable amount of 390 e.p. gasoline was available at the Gulf at slightly lower prices.

Traders reported that from 12 to 16 cargoes of No. 2 fuel oil were available at the Gulf, but current tanker rates prevented their movement to markets of consumption. The amount of oil available, however, could not be confirmed.

Reports indicated that Mid-Continent bright stock and neutral oil were available at lower prices at the Gulf.

One seller said that 190-200 vis. D 210 Mid-Continent bright stock was available at 23 cents a gallon, in barrels, for export movement, and that other oils were 0.5 cent lower generally.

California

Japs Inquire Again

N. P. N. News Bureau

LOS ANGELES, Jan. 8.—Japanese New Year holidays extending well into the past week called a halt to negotiations on bulk inquiry for aviation gasoline and diesel oil which entered the Pacific Coast market from the Far East a week ago.

Interest had been shown at that time in two cargoes of the fighting fuel and a small cargo of diesel. Prices on the former were expected to range upward of 10.50 cents per gallon, and on the latter in the neighborhood of $1.45 to $1.50 per barrel.

Local suppliers had also received a tentative inquiry from a third party that a Pacific foreign buyer was in the market for a large quantity of 375 e.p. gasoline in drums.

Continued warm weather in California caused some independent plants to lower quotations on diesel oil and stove distillate for domestic movement. Although posted prices remained at 3.5 to 5 cents and at 3.75 to 7 cents on the two grades, respectively, at Los Angeles Basin plants, some sales were reported made below these minimums.

Gasoline in tank cars continued to move at approximately the same levels, although several independent plants were reported offering distress goods at less than 7.5 cents, exclusive of all tax.

Wax

Scale Lower

NEW YORK, Jan. 10.—Prices of fully refined wax for export movement were reduced 0.25 cent by virtually all suppliers Jan. 3. Scale wax, both for export and domestic shipment also was lower the first week of January.

Traders here indicate that 122-124 and 124-126 white crude scale could be had for either domestic or foreign shipment at 2.5 cents and up. Firm offers at 2.5 cents, however, could not be confirmed.

Domestic and foreign demand for wax has been virtually at a standstill, sellers here reported.

Fuel Oil . . . . .

CHICAGO, Jan. 10.—Light fuels were active in the Mid-western market throughout the past week. Inquiries were numerous and a definite shortage was reported by many sellers.

While continued mild weather curtailed consumption somewhat during the midweek, demand increased as the week ended.

Heavy fuels continued sluggish.

Most Michigan refiners reported fairly good demand for U.G.I. gas oil. Heavy fuels were extremely burdensome, refiners said. A few Michigan distributors said they were moving some heavy fuel into the industrial centers in Ohio but this movement was too slight to relieve their heavy stocks.

* * *

NEW YORK, Jan. 10.—Demand for light fuel oils held up well in eastern saboard markets the first week of January. Seasonal temperatures prevailed and sellers here generally reported domestic consumption was heavy.

Industrial demand for heavy fuels has been slowed down by the recession in heavy industries, sellers here reported. Prices for the heavy oils have held relatively steady, however. Gulf prices have remained unchanged and this, coupled with the current level of tanker rates, has prevented movement of additional supplies into the seaboard markets.

* * *

TULSA, Jan. 10.—Mild weather in many sections of the north has caused some Mid-Continent refiners to offer No. 1 fuel more freely. Others, however, took this opportunity to store their "distillate cut" for use next spring as tractor fuel. At least three refiners reported building up stocks for this purpose.

Supplies of Nos. 2 and 3 oils either were scarce or closely held. Active inquiry the past week failed to bring out sizable quantities of these oils. Prices generally were unchanged.

Several refiners have tightened up on heavy fuels because of an expected increase in industrial activity.

Pa. Refinery Lubricating Oil Inventory

(Issued as of Dec. 30 by National Petroleum Assoc.)

	Gallons
1. **Raw Long Residuum** (Including all raw long residuum below, and not salable, as 600 fire)	1,081,444
2. **600 Steam Refined** (Includes all steam refined stock commonly sold or used as 600 and as raw material for bright stocks)	9,154,382
3. **Other Steam Refined** (Not included in 1 and 2 above)	6,476,739
4. **Finished Dewaxed Long Res.**	3,099,169
5. **Bright Stock** (Does not include any material reported in 4, above)	18,248,710
6. **Viscous Neutral,** below 180 vis. but not below 142 vis. @ 100	5,848,900
7. **Viscous Neutral,** 180 vis. @ 100 and above	9,413,994

TANK WAGON MARKETS, HEATING OILS

Prices in Effect Jan. 10, 1938

Following are tank wagon prices of various grades of heating oil at the points shown in various territories. Prices are in cents per gallon.

	No. 1	No. 2	No. 3	No. 4
S. O. NEW JERSEY				
Newark, N. J.	*	7.00	7.00	7.00
Atlantic City, N. J.	*	7.00	7.00	7.00
Baltimore, Md.	8.00	7.00	7.00	7.00
Washington, D. C.	8.50	7.75	7.75	7.75
SOCONY-VACUUM OIL CO. INC.				
(S. O. New York Division)				
New York City	*	7.50	7.50	7.50
Albany, N. Y.	*	7.50	7.50	7.50
Rochester, N. Y.	*	7.50	7.50	7.50
Boston, Mass.	*	7.00	7.00	7.00
Bangor, Me.	*	8.00	8.00	8.00
Manchester, N. H.	*	7.50	7.50	7.50
Burlington, Vt.	*	8.00	8.00	8.00
Hartford, Conn.	*	7.00	7.00	7.00
New Haven, Conn.	*	7.00	7.00	7.00
Providence, R. I.	*	7	7	7

*Prices for No. 1 fuel in S. O. New Jersey and Socony-Vacuum territories same as for kerosine which see in tank wagon table for various cities: prices change with kerosine.

	No. 1	No. 2	No. 3	No. 4
ATLANTIC REFINING				
Philadelphia, Pa.	7.75	7.00	7.00	7.00
Allentown, Pa.	8.25	7.50	7.50	7.50
Wilmington, Del.	8.25	7.50	7.50	7.50
Springfield, Mass.	9.00	7.50	....	7.50
Worcester, Mass.	9.00	7.50	....	7.50
Hartford, Conn.	9.00	7.50	....	7.50

S. O. OHIO

Cleveland and Columbus Divisions	7.50	7.50	7.00	....
City of Lima	8.00	8.00	7.00	....
Rest of Ohio	8.00	8.00	7.50	....

Note: S. O. Ohio prices are for full compartment hose dumps, bucket dumps are 0.5c per gallon higher.

S. O. INDIANA

Stanolex Fuel and Furnace Oils

	No. 1 Fuel	Stanolex Furnace
Chicago	†8.8	7.00
Indianapolis	...	*11.8
Detroit	...	7.1
Milwaukee	8.1	7.4
Minneapolis	7.5	7.5
Sioux City	7.2	7.2
St. Louis	7.5	6.8
Kansas City	6.6	6.6

*Includes state tax of 4c.

†This price applies to 1 to 99 gals. deliveries; 150 gals. and over, 7c.

Note: Small-lot deliveries of light fuel oils range up to 2c higher than above quotations.

REFINERY TANK CAR MARKETS

All prices on this page are publisher's opinion of open market quotations or sales, for spot shipment (10 to 15 days) unless otherwise stated. Prices in cents per gallon, except heavy fuel oils in dollars per barrel, wax and petrolatums in cents per pound in barrels, tank car lots, f.o.b. refineries in districts designated, except where otherwise noted. Inter-refinery and export prices not included unless so stated in the respective markets. Federal, state or municipal taxes not included. Prices quoted apply on products made from legally produced crude. Unless otherwise noted, gasoline octane ratings are determined by C.F.R. Motor method, A.S.T.M. D-357-33T; and lubricating oil specifications determined according to A.S.T.M. methods, unless otherwise noted

Cylinder Stocks (cont'd)

Prices Effective	Jan. 10	Jan. 3
Mid-Continent (cont'd)		
120 Vis. at 210° D:		
0 to 10 p.p.	15.125	15.125
10 to 25 p.p.	14.50	14.50
25 to 40 p.p.	14.25	14.25
600 S.R. Dark Green	5.00 – 7.50	5.00 – 7.50
600 S.R. Olive Green	7.00 – 9.50	7.00 – 9.50
631 S.R.	(b)12.50	(b)12.50
Black Oil	3.50 – 4.00	3.50 – 4.00
CHICAGO (Viscosity at 210°)		
Unfiltered Steam Refined:		
140	9.00	9.00
160	10.00	10.00
200	11.00	11.00
Bright stocks, 160 vis. at 210. No. 8 color:		
0 to 10 p.p.	17.75	17.75
15 to 25 p.p.	16.75	16.75
30 to 40 p.p.	16.25	16.25
E filtered Cyl. Stock	14.50	14.50

To obtain prices delivered in Chicago, add 0.25c per gal.

(a)Nominal.

(b)Only one refiner quoting.

Prices Effective	Jan. 10	Jan. 3
(f)WESTERN PENNA.		
600 S.R. filterable	7.50 – 8.00	7.50 – 8.00
650 S.R.	10.50 –11.50	10.50 –11.50
600 fl.	11.00 –12.00	11.00 –12.00
630 fl.	14.00 –16.00	14.00 –16.00
600 Warren E	13.00 –13.50	13.00 –13.50

(f)Quotations only.

Bright stock, 145-155 vis. at 210°, 540-550 flash, No. 8 color:		
10 p.t.	18.00 –18.50	18.00 –18.50
15 p.t.	17.00 –17.50	17.00 –17.50
20 p.t.	16.00 –16.50	16.00 –16.50
25 p.t.	15.00 –16.00	15.00 –16.00

Petrolatums

Prices Effective	Jan. 10	Jan. 3
WESTERN PENNA. (Per lb., in barrels, carload lots. In tank cars, 0.5c per lb. less).		
Snow white	6.625– 6.75	6.625– 6.75
Lily White	5.625– 5.75	5.625– 5.75
Cream White	4.625– 4.75	4.625– 4.75
Light Amber	2.75 – 2.875	2.75 – 2.875
Amber	2.50 – 2.625	2.50 – 2.625
Red	2.125– 2.375	2.125– 2.375

Wax

Prices Effective	Jan. 10	Jan. 3
WESTERN PENNA. (Per lb., f.o.b. New York basis.)		
122-124 w.c. scale, A.m.p.	2.55 – 2.60	(a)2.75– 2.82
124-126 w.c. scale, A.m.p.	2.55 – 2.60	2.75– 2.82
OKLAHOMA (Per lb. in bbls.; in a few instances, per lb. in burlap bags).		
124-126 w.c. scale, A.m.p.	2.90 – 3.00	3.00
CHICAGO (In bags, carload lots. Melting points are E.M.P. (A.S.T.M.) methods; add 3° F. to convert into A.m.p.)		
Fully refined:		
122-124	4.65 – 4.75	4.65 – 4.75
125-127	4.90 – 5.00	4.90 – 5.00
127-129	5.05 – 5.15	5.05 – 5.15
130-132	**5.45 – 5.55	**5.45 – 5.55
132-134	**5.70 – 5.80	**5.70 – 5.80
135-137	**6.45 – 6.55	**6.45 – 6.55

**Same prices quoted in bags or slabs loose.

MID-WESTERN TANK CAR MARKET

Prices are those made by Chicago sellers, on Group 3 (Oklahoma) freight basis, although shipments may originate in other South-western or Mid-western refining districts

Gasoline

Prices Effective	Jan. 10	Jan. 3
U. S. Motor: (Octane Test L-3)		
62 oct. and below	3.75 – 4.25	3.75 – 4.25
63-66 oct.	4.00 – 4.50	4.00 – 4.50
67-69 oct.	4.375– 4.625	4.375– 4.625
70-72 oct.	4.50 – 5.00	4.50 – 5.00
64-66, 375 e.p.	(b)4.25	(b)4.25
68-70, 350-360 e.p.	(b)5.25	(b)5.25

Kerosine

41-43 w.w.	4.125– 4.375	4.125– 4.375
42-44 w.w.	4.25 – 4.625	4.25 – 4.625

(b)One seller quoting.

Fuel *and* Gas Oils

Prices Effective	Jan. 10	Jan. 3
Domestic:		
No. 1 p.w.	4.125– 4.375	4.125– 4.375
No. 1 straw	3.875– 4.125	3.875– 4.125
No. 2 straw	3.75 – 3.875	3.75 – 3.875
No. 2 dark	3.625– 3.75	3.625– 3.75
No. 3	3.50 – 3.625	3.50 – 3.625
No. 4	$1.05 –$1.10	$1.05 –$1.10
No. 5	$0.80 –$0.85	$0.80 –$0.85
Range oil	4.125– 4.50	4.125– 4.50
Industrial:		
No. 4	$0.95 –$1.10	$0.95 –$1.10
No. 5	$0.775–$0.85	$0.775–$0.85

Prices Effective	Jan. 10	Jan. 3
Industrial (cont'd)		
No. 6	$0.50 –$0.55	$0.55 –$0.65
U. G. I. gas oil	2.875– 3.25	2.875– 3.25

Naphtha and Solvent

Stoddard solvent	6.875	6.875
Cleaners' naphtha	7.375	7.375
V. M. & P. naphtha	7.375	7.375
Mineral spirits	6.375	6.375
Rubber solvent	7.375	7.375
Lacquer diluent	8.375	8.375

DAILY GASOLINE PRICES

Daily range of gasoline prices as reported in PLATT'S OILGRAM (Week Ended Jan. 7, 1938)

U. S. Motor, (Octane Number determined according to L-3 Method):	Jan. 3	Jan. 4	Jan. 5	Jan. 6	Jan. 7
62 octane and below:					
Oklahoma	4.00 – 4.25	4.00 – 4.25	4.00 – 4.25	4.00 – 4.25	4.00 – 4.25
*North Texas	†4.50 – 4.875	†4.50 – 4.875	†4.50 – 4.875	†4.50 – 4.875	†4.50 – 4.875
West Texas	4.625– 4.75	4.625– 4.75	4.625– 4.75	4.625– 4.75	4.625– 4.75
Mid-Western (Group 3 basis)	3.75 – 4.25	3.75 – 4.25	3.75 – 4.25	3.75 – 4.25	3.75 – 4.25
63-66 octane:					
Oklahoma	4.375– 4.50	4.375– 4.50	4.375– 4.50	4.375– 4.50	4.375– 4.50
*North Texas	†5.00 – 5.375	†5.00 – 5.375	†5.00 – 5.375	†5.00 – 5.375	†5.00 – 5.375
West Texas	5.125– 5.25	5.125– 5.25	5.125– 5.25	5.125– 5.25	5.125– 5.25
Mid-Western (Group 3 basis)	4.00 – 4.50	4.00 – 4.50	4.00 – 4.50	4.00 – 4.50	4.00 – 4.50
67-69 octane:					
Oklahoma	4.625– 4.875	4.625– 4.875	4.625– 4.875	4.625– 4.875	4.625– 4.875
*North Texas	†5.375– 5.75	†5.375– 5.75	†5.375– 5.75	†5.375– 5.75	†5.375– 5.75
West Texas	5.50 – 5.625	5.50 – 5.625	5.50 – 5.625	5.50 – 5.625	5.50 – 5.625
Mid-Western (Group 3 basis)	4.375– 4.625	4.375– 4.625	4.375– 4.625	4.375– 4.625	4.375– 4.625
70-72 octane:					
Oklahoma	4.875– 5.25	4.875– 5.25	4.875– 5.25	4.875– 5.25	4.875– 5.25
*North Texas	†5.625– 6.00	†5.625– 6.00	†5.625– 6.00	†5.625– 6.00	†5.625– 6.00
West Texas	5.875	5.875	5.875	5.875	5.875
Mid-Western (Group 3 basis)	4.50 – 5.00	4.50 – 5.00	4.50 – 5.00	4.50 – 5.00	4.50 – 5.00
Motor Gasoline, 60-64 oct.					
New York harbor	†6.75	†6.75	†6.75	†6.75	†6.75
Philadelphia district	†7.00	†7.00	†7.00	†7.00	†7.00
Baltimore district	†6.75 – 7.25	†6.75 – 7.25	†6.75 – 7.25	†6.75 – 7.25	†6.75 – 7.25
Motor Gasoline, 65 oct. & above:					
New York harbor	†7.00	†7.00	†7.00	†7.00	†7.00
Philadelphia district	†7.00 – 7.25	†7.00 – 7.25	†7.00 – 7.25	†7.00 – 7.25	†7.00 – 7.25
Baltimore district	†7.00 – 7.50	†7.00 – 7.50	†7.00 – 7.50	†7.00 – 7.50	†7.00 – 7.50
U. S. Motor, 58-62°:					
Other districts (Western Penna.)	4.75 – 5.00	4.75 – 5.00	4.75 – 5.00	4.75 – 5.00	4.625– 4.875
Motor Gasoline, Min. 65 oct.:					
Bradford-Warren (Western Penna.)	6.75 – 7.00	6.75 – 7.00	6.75 – 7.25	6.75 – 7.25	6.75 – 7.25
Other districts (Western Penna.)	6.75 – 7.25	6.75 – 7.25	6.75 – 7.25	6.75 – 7.25	6.625– 7.125

*For shipment to Texas and New Mexico destinations; Group 3 prices are quoted on northern shipment.

†Nominal.

‡Only one refiner quoting.

TANK WAGON MARKETS

Tax column includes 1c federal tax, state gasoline tax, also city and county taxes as indicated in footnotes, and inspection fees, as shown in general footnote. These prices in effect Jan. 10, 1938, as posted by principal marketing companies at their headquarters offices, but subject to later corrections

S. O. New Jersey

ESSOLENE

	Consumer Tank Car	Dealer T.W.	Taxes	Kerosine T.W.
Atlantic City, N. J.	7.25	8.75	4	9
Newark, N. J.	7.25	8.75	4	9
Annapolis, Md.	8.35	9.85	5	9.5
Baltimore, Md.	7.75	9.25	5	9
Cumberland, Md.	9.15	11.65	5	10
Washington, D. C.	8	9.5	3	9.5
Danville, Va.	8.95	11.45	6	12.9
Norfolk, Va.	7.75	10.25	6	11.5
Petersburg, Va.	8.05	10.55	6	11.7
Richmond, Va.	8.05	10.55	6	11.7
Roanoke, Va.	9.25	11.75	6	12.9
Charleston, W. Va.	8.55	11.05	6	12.6
Parkersburg, W. Va.	7.85	10.35	6	11.2
Wheeling, W. Va.	8.85	10.25	6	12.2
Charlotte, N. C.	9.15	11.65	7	12.6
Hickory, N. C.	9.65	12.15	7	13
Mt. Airy, N. C.	9.45	11.95	7	12.8
Raleigh, N. C.	8.75	11.25	7	12.1
Salisbury, N. C.	9.25	11.75	7	12.7
Charleston, S. C.	7.75	10.25	7	11.1
Columbia, S. C.	8.75	11.25	7	12.1
Spartanburg, S. C.	9.45	11.95	7	12.9

Price basis to undivided dealers: Dealer t.w. price less 0.5c per gal.

Price basis to commercial consumers: To contract accounts, purchasing at least one full compartment at a time by hose connection: Effective March 12, 1937, in New Jersey, and March 8 in Maryland, District of Columbia, and in Arlington and Fairfax Counties in Virginia, on yearly purchases: from 2,500 to 100,000 gals., consumer t.w. price at time and place of delivery; 100,000 gals per year consumer tank car price, plus 0.5c per gal. Generally consumer t.w. price in foregoing states is equivalent of dealer t.w. price, less 0.5c per gal.

Effective May 15, 1937, on Essolene and Esso (by tank wagon) in North and South Carolina, West Virginia and Virginia (except Arlington and Fairfax Counties, which see above), commercial consumers taking deliveries of 50 gals. (West Va. 100 gals.) or more at one time will be billed at the posted consumer t.w. price. Deliveries less than 50 gals. (West Va. 100 gals.) will be billed at 4c per gal. over posted consumer t.w. price. Generally, posted consumer t.w. price will be equivalent to the dealer price less 0.5c per gal.

Kerosine Discount: 1c off t.w. price for 25 gals or more, under contract thru territory (Baltimore City contract not necessary) except no discount in state of New Jersey.

Socony-Vacuum Oil Co., Inc.

(S. O. New York Division)

SOCONY MOBILGAS

	Consumer Tank Car	"Split" Dealer T.W.	Taxes	Total "Split" Dealer T.W.	Kerosine T.W.
Metropolitan N. Y. City: Boroughs of Manhattan, Bronx and Brooklyn (Kings and Queens)	7.5	9.5	*5	14.5	8.75
Borough of Richmond (Staten Is.)	7.5	9.5	*5	14.5	8.75
Albany, N. Y.	7.5	9.5	5	14.5	9
Binghamton, N. Y.	8.7	10.3	5	15.3	9
Buffalo, N. Y.	8.04	9	5	14	7.5
Jamestown, N. Y.	7.78	10.8	5	15.8	8.25
Plattsburg, N. Y.	7.9	10.4	5	15.4	9.5
Rochester, N. Y.	8.17	10	5	15	8.5
Syracuse, N. Y.	8.12	9.5	5	14.5	9
Danbury, Conn.	7.8	9.8	4	13.8	9
Hartford, Conn.	7.6	9.6	4	13.6	8.5
New Haven, Conn.	7.5	9.5	4	13.5	8
Bangor, Me.	8.2	9.8	5	14.8	9.5
Portland, Me.	7.7	9.5	5	14.5	8.75
Boston, Mass.	7.5	9	4	13	8.5
Concord, N. H.	8.2	10.5	5	15.5	9.5
Lancaster, N. H.	9.1	11.5	5	16.5	10.25
Manchester, N. H.	8	10	5	15	9
Providence, R. I.	7.5	9.3	4	13.3	8.5
Burlington, Vt.	7.9	9.9	5	14.5	9.5
Rutland, Vt.	8.2	10.2	5	15.2	9

*Plus 2% city sales tax computed at time of each sale

Note: Socony-Vacuum has transferred all service stations to dealers; no prices available

Price basis to undivided dealers: 0.5c less than "split" dealer t.w

Price basis to commercial consumers: Effective about Nov. 15, 1936 in New York and New England for tank wagon delivery: monthly purchases of 25,000 gals. or over, pay consumer tank car price at point of delivery, plus 0.5c gal.; monthly purchases of 5,000 to 25,000 gals., pay undivided dealer tank wagon price at point of delivery; monthly purchases of less than 5,000 gals., pay divided dealer tank wagon price at point of delivery. Private consumers pay undivided dealer tank wagon price at point of delivery, plus 2c gal.

Atlantic Refining

ATLANTIC WHITE FLASH GASOLINE

	Commercial Tank Car	All Tax	Total Dealer T.W.	S.S.	Kerosine T.W.
Philadelphia, Pa.	7.25	5	13.25	17	10.5
Pittsburgh	8	5	15	20	11
Allentown	7.75	5	14.25	**	11
Erie	8	5	14.5	**	10
Scranton	8	5	14.5	**	11
Altoona	8	5	15	**	11
Harrisburg	7.5	5	14	**	11
Williamsport	8	5	15	**	11
Dover, Del.	...	5	14.5	**	11
Wilmington	...	5	14	**	11
Boston, Mass.	...	4	13	**	8.5
Springfield, Mass.	...	4	13.5	**	8.5
Worcester, Mass.	...	4	14.3	**	9
Fall River, Mass.	...	4	12.5	**	8.5
Hartford, Conn.	...	4	13.6	**	8.5
New Haven, Conn.	...	4	13.5	**	8
Providence, R. I.	...	4	13.3	**	8.5
Atlantic City, N. J.	...	4	12.75	**	9
Camden, N. J.	...	4	12.75	**	9
Trenton, N. J.	...	4	12.75	**	9
Annapolis, Md.	...	5	14.85	**	9.5
Baltimore, Md.	...	5	14.25	**	9
Hagerstown, Md.	...	5	15.35	**	10
Richmond, Va.	...	6	16.55	**	11.7
Wilmington, N. C.	...	7	17.35	**	11.3
Brunswick, Ga.	...	7	16	**	*13
Jacksonville, Fla.	...	8	17	**	10

*Georgia has kerosine tax of 1c per gal., not included in above price.

**Atlantic Refining transferred stations to dealers; no prices available.

Price basis to undivided dealers: Dealer t.w less 0.5c per gal.

Price basis to commercial consumers: in Penna. and Delaware, effective Mar. 11, 1937, on yearly gasoline purchases to contract accounts taking full compartment hose deliveries, using 100,000 gals. or more per year, tank car price plus 0.5c per gal.; consumers taking less than 100,000 gals., undivided dealer price. Consumers under contract and not under contract, taking less than full compartment delivery, and consumers not under contract taking full compartment delivery, get divided dealer price. Consumers taking less than 25 gals., t.w delivery, get 4c above undivided dealer price.

Discount on kerosine: Effective Oct. 29, 1936, in Pennsylvania and Delaware. 2c per gal. off t.w. price on t.w deliveries of 25 gals. or more at one time.

S. O. Ohio

SOHIO X-70 GASOLINE

(Regular Grade)

	All Tax	Consumer T.W.	†Divided Dlr.	Kerosine T.W.
Ohio State-wide	5	16	15	*13
Counties where prices are below statewide:				
Columbiana, Defiance and Pickaway	5	15.5	14.5	....
Franklin, Knox and Paulding		15	14	....

RENOWN GASOLINE

(Third Grade)

Ohio State-wide	5	15.5	14.5	....
Counties where prices are below statewide:				
Columbiana, Defiance and Pickaway	5	15	14	....
Franklin, Knox and Paulding	5	14.5	13.5	....
Counties where prices are above statewide:				
Butler, Clermont, Darke, Greene, Hamilton, Miami, Montgomery, Preble and Warren	5	16	15	....

S. O. Ohio Cont'd

KEROSINE PRICES

(Off Statewide Level)

Kerosine prices are off statewide level in the following counties:

Allen, Auglaize, Champaign, Columbiana, Darke, Geauga, Greene, Hardin, Logan, Mahoning, Mercer, Preble, Putnam, Shelby, Trumbull, Union, Van Wert and Wyandot:	*12.5
Paulding	*12
Ashtabula	*11.5
Fayette, Licking, Madison, Pickaway, Portage and Summit	*9.5

*Kerosine prices include 1c state tax.

Commercial Tank Wagon Q.D.A. to contract accounts: Effective Oct. 20, 1937, thru Ohio (except in 25 counties), on monthly purchases, off posted consumer t.w. price: 0 to 999 gals., 0.5c; 1,000 to 19,999 gals., 1.5c; 20,000 gals. and over, 2.5c. The 25 counties where Q.D.A. differs from statewide are: Allen, Auglaize, Champaign, Darke, Defiance, Erie, Fulton, Geauga, Hamilton, Henry, Logan, Lorain, Lucas, Meigs, Mercer, Ottawa, Paulding, Putnam, Sandusky, Scioto, Shelby, Van Wert, Washington, Williams and Wood.

†This price also to authorized agents, exclusive of 0.5c rental.

Sales tax: Ohio's 3% sales tax, effective Jan. 27, 1935, is added "where assessable, to regular posted prices," S. O. Ohio says.

On kerosine, prices to resellers and commercial consumers are posted generally at 3c per gal. below consumer t.w. price in any quantity, when such prices are on statewide level.

S. O. Kentucky

CROWN GASOLINE

(Regular Grade)

	Consumer T.W.	All Tax	Total Consumer T.W.	Net Dlr.	Kerosine T.W.
Covington, Ky.	12.5	6	18.5	16.5	11
Lexington, Ky.	13.5	6	19.5	16.5	11
Louisville, Ky.	13	6	19	16	10.5
Paducah, Ky.	13.5	6	19.5	16.5	10
Jackson, Miss.	13	7	20	17	*13
Vicksburg, Miss.	13	7	20	17	*13
Birmingham, Ala.	14	*8	22	19	12
Mobile, Ala.	13	*9	22	19	11
Montgomery, Ala.	13	*9	22	19	*13
Atlanta, Ga.	14	7	21	18	*12
Augusta, Ga.	14	7	21	18	*14
Macon, Ga.	14	7	21	18	*14.5
Savannah, Ga.	12	7	19	16	*12
Jacksonville, Fla.	12	8	20	17	10
Miami, Fla.	12.5	8	20.5	17.5	12.5
Pensacola, Fla.	13	*9	22	19	12
Tampa, Fla.	12	8	20	17	10.5

KYSO GASOLINE

(Third Grade)

Covington, Ky.	10.5	6	16.5	14	....
Lexington, Ky.	11.5	6	17.5	15	....
Louisville, Ky.	11	6	17	14.5	....
Jackson, Miss.	11.5	7	18.5	16	....
Vicksburg, Miss.	11	7	18	15.5	....
Birmingham, Ala.	12	*8	20	17.5	....
Mobile, Ala.	10.5	*9	19.5	17	....
Montgomery, Ala.	10.5	*9	19.5	17	....
Atlanta, Ga.	12	7	19	16.5	....
Augusta, Ga.	12	7	19	16.5	....
Macon, Ga.	12.5	7	19.5	17	....
Savannah, Ga.	10.5	7	17.5	15	....
Pensacola, Fla.	11	*9	20	17.5	....

Discounts to all tank wagon consumers: Effective Jan. 4, 1937, thru territory, on Crown gasoline, 3c per gal. below consumer t.w. price; on Kyso, 2.5c below, regardless of quantity purchased, per month.

Discounts on kerosine: Prices in Kentucky are net, but in other states subject to 2c discount.

**Taxes*: in the tax column is included these city and county gasoline taxes at the following points: Mobile, 2c city; Birmingham, 1c city; Montgomery, 1c city and 1c county; Pensacola, 1c city. Georgia and Mississippi kerosine prices include 1c state tax. Montgomery kerosine price includes 1c city tax.

Above prices include these inspection fees on both gasoline and kerosine, per gallon, figured on basis of 50 gallons per barrel:

Alabama, 1/40c on gasoline, 1/2c on kerosine; Arkansas, 1/5c per gal. in a single barrel. 1/20e per gal. in bulk; Florida, 1/8c; Illinois, 3/100c; Indiana, 1/5c per gal. in lots up to 25 bbls.; 2/25c per gal. in lots of 25 bbls. or more; Kansas, 1/50c, (3/50c can be charged to meet inspection department expenses); Louisiana, 1/32c; Minnesota, 1/25c; Missouri, 3/100c; Nebraska, 3/100c; Nevada, gasoline, 1/20c; North Carolina, 1/4c; North Dakota, 1/20c; Oklahoma, 2/25c per gal. in lots of more than 50 bbls., 1/5c in lots less than 50 bbls.; South Carolina, 1/8c; South Dakota, 1/10c; Tennessee, 2/5c; and Wisconsin, 1/25c.

Kerosine inspection fee only: Iowa, 3/50c; Michigan, 1/5c per gal.

TANK WAGON MARKETS

Tax column includes 1c federal tax, state gasoline tax, also city and county taxes as indicated in footnotes, and inspection fees, as shown in general footnots. These prices in effect Jan. 10, 1938 as posted by principal marketing companies at their headquarters offices but subject to later corrections

S. O. Indiana

	Tax	Red Crown Total Cons. T.W.	Dealer Prices Red Crown	Stanolind	Kerosine T.W.
Chicago, Ill.	4	15.3	13.3	12.1	10.2
Decatur, Ill.	4	15.3	13.8	13.1	10.2
Joliet, Ill.	4	15.3	13.8	12.1	10.2
Peoria, Ill.	4	15.3	13.8	13.3	10.2
Quincy, Ill.	4	15.1	13.6	12.5	10
Indianapolis, Ind.	5	16.9	15.4	14.7	*14.8
Evansville, Ind.	5	16.8	15.3	13.1	*14.7
South Bend, Ind.	5	17.2	15.7	14.2	*14.2
Detroit, Mich.	4	15.1	13.6	13.1	9.8
Grand Rapids, Mich.	4	16.3	14.8	14.3	11
Saginaw, Mich.	4	16.1	14.6	14.1	*9.1
Green Bay, Wis.	5	17	15.5	14.8	10.9
Milwaukee, Wis.	5	16.5	15	14.2	10.4
La Crosse, Wis.	5	16.7	15.2	14.7	10.6
Minneapolis-St. Paul	5	16.7	15.2	14.7	10.6
Duluth, Minn.	5	17	15.5	15	10.9
Mankato, Minn.	5	16.7	15.2	14.7	9.5
Des Moines, Ia.	4	15.1	13.6	11	*11
Sioux City, Ia.	4	15.3	13.8	13.3	*13.2
Davenport, Ia.	4	15.3	13.8	13.3	*13.2
Mason City, Ia.	4	15.4	13.9	13.4	*13.3
St. Louis, Mo.	*4	14.9	13.4	11.2	9.8
Kansas City, Mo.	*4	14.6	13.1	12.6	8.5
St. Joseph, Mo.	*4	14.6	11.4	10	9
Fargo, N. D.	4	16.7	15.2	14.7	11.6
Minot, N. D.	4	17.9	16.4	15.9	12.8
Huron, S. D.	*5	17.1	15.6	15.1	*11
Wichita, Kans.	4	14.1	12.4	10.5	8.5

*Taxes: in the tax column is included these city and state gasoline taxes at following points: Kansas City, St. Joseph and St. Louis, 1c city tax; South Dakota, 0.1c sales tax. State Kerosine taxes: Indiana, 4c; Iowa, 3c, all included in above prices.

Discount to commercial consumers: Effective Jan. 1, 1935, thru territory, except Michigan effective Feb. 1, on purchases per month, discount off t.w prices; all gasolines, 25 to 1,000 gals., at t.w. price; 1,000 gals., or more, 1.5c off t.w. on Ethyl and Red Crown, and 1c on Stanolind (latter effective June 9, 1937). Minimum delivery is 25 gals

S. O. Nebraska

STANDARD RED CROWN GASOLINE

	All Tax	T.W. Total	Dealer Total	Kerosine T.W.
Omaha, Neb.	6	17.7	16.2	10.5
McCook	6	18.4	16.9	11.2
Norfolk	6	18.1	16.6	10.9
North Platte	6	18.5	17	11.3
Scottsbluff	6	19.2	16	12

Discounts to commercial consumers: for tank wagon deliveries covered only by Standard Commercial Consumer Contract, effective January 1, 1935.

S. O. Louisiana

ESSOLENE

	Consumer Tank Car	Dealer T.W.	Taxes	Kerosine T.W.
Little Rock, Ark.	7.75	10.25	7.5	11.5
Alexandria, La.	7.75	10.25	8	*10.5
Baton Rouge, La.	7.25	9.75	8	*12
New Orleans, La.	7.25	9.75	*10	*12
Lake Charles, La.	8.25	10.75	8	*12.5
Shreveport, La.	6.75	9.25	8	*9.5
Lafayette, La.	8.25	10.75	8	*13
Bristol, Tenn.	10.25	11.5	8	14.5
Chattanooga, Tenn.	9.75	12.25	8	13.5
Knoxville, Tenn.	10.25	12.75	8	14
Memphis, Tenn.	8.25	10.75	8	12
Nashville, Tenn.	9.25	11.75	8	11.5

*New Orleans gasoline tax includes 7c state, 1c federal, and 2c parish tax. Louisiana kerosine prices include 1c state tax; in addition New Orleans has 1c parish tax.

Price basis to dealers: Undivided dealers get dealer price, less 0.5c

Price basis to commercial consumers: Effective May 15, 1937, thru territory; commercial consumers taking 50 gals. or more at one time will be billed at posted consumer t.w. price; those taking less than 50 gals. at one time will be billed at 4c per gal. over posted consumer t.w. price. Generally, the posted consumer t.w. price will be equivalent to the dealer price less 0.5c per gal.

Humble Oil & Refining Co.

HUMBLE MOTOR FUEL

	*T.W.	Taxes	*Total T.W.	S.S.	Kerosine T.W.
Dallas, Tex.	9	5	14	18	8
Ft. Worth, Tex.	9	5	14	18	8
Houston, Tex.	9.5	5	14.5	18.5	8
San Antonio, Tex.	9.5	5	14.5	18.5	8

U. S. Motor Gasoline
(*Third Grade*)

Dallas, Tex.	7	5	12	15	
Ft. Worth, Tex.	7.5	5	12.5	15	
Houston, Tex.	8.5	5	13.5	16.5	
San Antonio, Tex.	8.5	5	13.5	16.5	

*Price is t.w. price to all classes of dealers and consumers.

Price basis to "open" dealers: discount off posted retail price: when posted retail price, including all taxes on Esso motor fuel is: 19.1c per gal. and above, discount is 3.5c; 19c to 18.1c, 3c, and 18c and below, 2.5c. Humble motor fuel, 17.1c and above, 3.5c; 17 to 16.1c, 3c; and 16c and below, 2.5c; U. S. motor fuel, 15.1c and above, 2.5c; 15 to 14.1c 2c; and 14c and below, 1.5c.

Continental Oil

	Conoco Bronze Ex-Tax	All Tax	Dealer Prices Total Conoco Bronze	Dealmand	Kerosine T.W.
Denver, Colo.	10	5	15	14	11.5
Grand Junc., Colo.	14	5	19	18	15
Pueblo, Colo.	11	5	16	14	10.5
Casper, Wyo.	12	5	17	16	11.5
Cheyenne, Wyo.	11	5	16	12	13
Billings, Mont.	13.5	6	19.5	18	15.5
Butte, Mont.	13.5	6	19.5	16.5	15.5
Great Falls, Mont.	13.5	6	19.5	18.5	15.5
Helena, Mont.	13.5	6	19.5	18.5	15.5
Salt Lake City, Utah	14.5	5	19.5	16.5	16
Boise, Ida.	15.5	6	21.5	20.5	18
Twin Falls, Ida.	15	6	21	20	18
Albuquerque, N. M.	11	†6.5	17.5	16.5	12
Roswell, N. M.	11	†6.5	17.5	15	10.5
Santa Fe, N. M.	12	*7	19	16.5	12
Muskogee, Okla.	9.5	5	14.5	13	7
Oklahoma City, Okla.	9	5	14	11	8
Tulsa, Okla.	9	5	14	11	6
Ft. Smith, Ark.	9.75	5	14.75	13.5	8
Little Rock, Ark.	9.75	7.5	17.25	15.125	9.5
Texarkana, Ark.	9	5	14	11	8.5

†Includes city tax of 0.5c.
*Includes 1c city tax.

S. O. California

STANDARD GASOLINE

	T.W.	Taxes	Total T.W.	S.S.	Kerosine T.W.
San Francisco, Cal.	13.5	4	17.5	18.5	11.5
Los Angeles, Cal.	13	4	17	18	10
Fresno, Cal.	14.5	4	18.5	19.5	12.5
Phoenix, Ariz.	15	6	21	22	†17
Reno, Nev.	15	5	20	21	13
Portland, Ore.	14	6	20	21	13.5
Seattle, Wash.	14	6	20	21	13.5
Spokane, Wash.	16.5	6	22.5	23.5	16
Tacoma, Wash.	14	6	20	21	13.5

FLIGHT GASOLINE
(*Third Grade*)

San Francisco, Cal.	12	4	16	17	....
Los Angeles, Cal.	11.5	4	15.5	16.5	....
Fresno, Cal.	13	4	17	18	....
Reno, Nev.	13.5	5	18.5	19.5	....
Phoenix, Ariz.	13.5	6	19.5	20.5	....
Portland, Ore.	12.5	6	18.5	19.5	....
Seattle, Wash.	12.5	6	18.5	19.5	....
Spokane, Wash.	15	6	21	22	....
Tacoma, Wash.	12.5	6	18.5	19.5	....

†Includes 5c state tax

Discount to dealers: on gasoline, off t.w. price on Standard Ethyl and Standard Gasoline, to 100% dealers, 3c; to split dealers, 2c; on Flight gasoline, both 100% and split dealers, 2c.

On Stanavo Aviation Gasoline, to all classes of dealers, 3c off t.w

To commercial consumers: off tank wagon price; on single deliveries of 40 gallons and over, Stanavo Aviation, Standard Ethyl and Standard Gasolines, 3c. Flight Gasoline, 2c per gallon. Tank wagon delivery, less than 40 gals., 1c per gal. above posted t.w. price.

On kerosine 3c off t.w. price; plant deliveries to jobbers, 2.5c below t.w.

Canada

PRICES OF IMPERIAL OIL LTD.

Per Imperial Gallon, which is 1.2 U. S. Gallons

3-STAR IMPERIAL GASOLINE

	T.W.	Taxes	Total T.W.	Kerosine T.W.
Hamilton, Ont.	16	6	22	17
Toronto, Ont.	16	6	22	17
Brandon, Man.	22.8	7	29.8	22.3
Winnipeg, Man.	20.5	7	27.5	20.7
Regina, Sask.	20	7	27	22
Saskatoon, Sask.	22.8	7	29.8	24.8
Edmonton, Alta.	19.5	7	26.5	21.5
Calgary, Alta.	17	7	24	19
Vancouver, B. C.	16	7	23	23
Montreal, Que.	15	6	21	17.5
St. John, N. B.	16	8	24	18.5
Halifax, N. S.	16	8	24	18.5

Note: Imperial Oil Ltd. has completed transfer of service stations to dealers; no s.s. prices available.

Discounts to undivided dealers, 1c off t.w. price, except Maritime Provinces where undivided dealers pay t.w. price. Divided dealers pay t.w. price, thru territory.

Aviation Gasoline

Following are tank car and/or tank wagon prices of aviation gasoline in principal marketing territories (Stanavo aviation in all territories except where otherwise noted). Tax column includes 1c federal tax, and state tax; also municipal taxes as indicated in footnotes. Prices in first four territories do not include state or federal taxes.

S. O. NEW JERSEY

	*Ethyl T.C.	Tank Car	T.W.
Bayonne, N. J.	19.5	9.5	12.5
Baltimore, Md	....	10	13
Washington, D. C.	....	....	13.5
Richmond, Va.	....	....	14.7
Greensboro, N. C.	....	....	15.7
Raleigh, N. C.	....	....	17.6
Charleston, W. Va.	....	....	12.2

*This is Stanavo Ethyl Aviation Gasolin 100 octane number, tank car price.

COLONIAL BEACON OIL CO.

	T.W.
Brooklyn, N. Y.	12.8
Buffalo, N. Y.	14.5
Boston, Mass.	15

S. O. PENNSYLVANIA

Philadelphia, Pa.	13.6
Pittsburgh, Pa.	14.4

S. O. LOUISIANA

New Orleans, La.	13.3
Shreveport, La.	13.6

Prices in above four territories are on a 74 octane grade aviation gasoline except where otherwise noted. An 80 octane product generally brings 0.5c premium and an 87 octane product, 1.5c premium over the 74 octane grade.

Note: S.a. prices in above four territories are generally 6c over t.w. prices. Above t.w prices are net, with no discounts allowed for quantity purchases. T.w. prices are generally tank car price, plus freight, plus 2.5c per gal

S. O. OHIO

Thru Ohio

Stanavo Ethyl Aviation

	Consumer T.W.	Tax	Total Consumer T.W.
73 octane	15.5	5	20.5
80 octane	16.5	5	21.5
87 octane	17.5	5	22.5

Discounts: For delivery on contract to hangar operators and resellers: 2c below consumer posted t.w price, shown above

S. O. INDIANA

Stanolind Aviation Gasoline

(73 octane number at Kansas City; 62 octane at other published points)

Chicago, Ill.	14.6	4	18.6
Detroit, Mich.	16.1	4	20.1
Milwaukee, Wisc.	14.8	5	19.8
Minneapolis, Minn.	15	5	20
St. Louis, Mo.	14.2	3	17.2
Kansas City, Mo.	13.9	*4	17.9
Fargo, N. D.	16	4	20
Huron, S. D.	15.4	5	20.4

*Includes 1c city tax

HUMBLE OIL & REFINING CO.

	Tank Car
Baytown, Tex. (exclusive of taxes)	8.5

CONTINENTAL OIL CO.

Conoco Special Gasoline	Dealer	Tax	Total Dealer
Denver, Colo.	13	5	18
Cheyenne, Wyo.	15	5	20
Helena, Mont.	16.5	6	22.5
Salt Lake City, Utah	17.5	5	22.5
Albuquerque, N. M.	14	*6.5	20.5

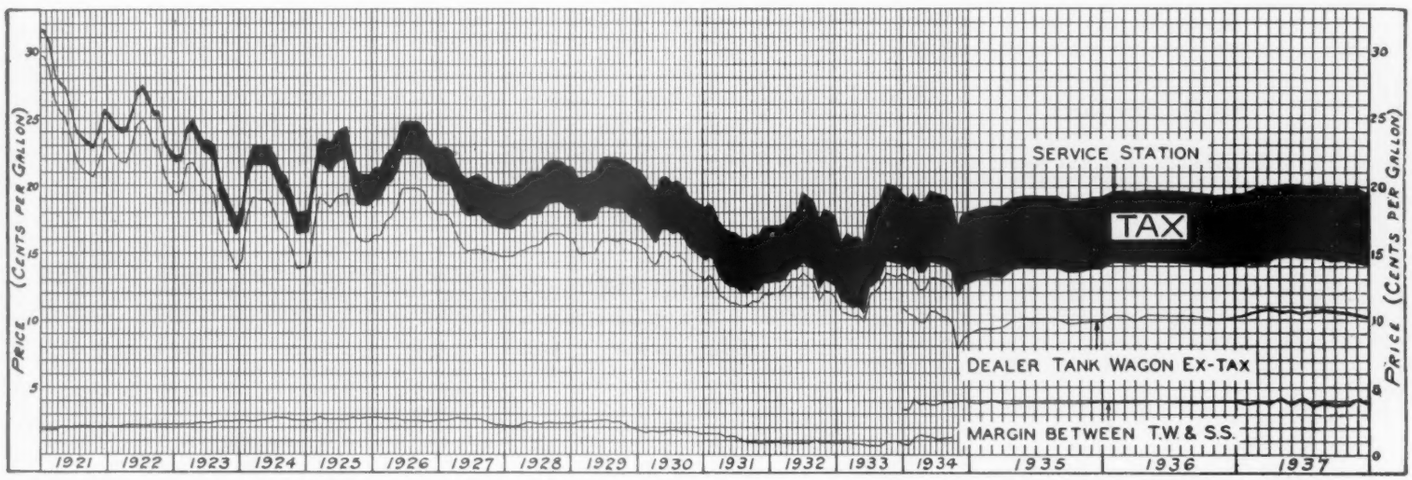
*Includes city tax of 0.5c

S. O. CALIFORNIA

	T.W.		Total T.W.
Phoenix, Ariz.	17	6	23
Los Angeles, Cal.	15	4	19
San Francisco, Cal.	15.5	4	19.5
Reno, Nev.	17	5	22
Portland, Ore.	16	6	22
Seattle, Wash.	16	6	22
Spokane, Wash.	18.5	6	24.5

Note: For discounts, etc., see note under Standard and Flight gasoline above

Trend of Gasoline Prices and Gasoline Taxes, at 50 Representative Cities



Crude Price Changes

CHICAGO—Effective Jan. 5 The Pure Oil Co. reduced Midland and Buckeye, Mich., crude 15 cents per barrel, to new prices of $1.12 and $1.095 per barrel respectively.

MT. PLEASANT, Mich.—Effective Jan. 8 Simrall Corp. met the price reductions of the Pure Oil on Michigan crude, by reducing Greendale, Porter, Crystal, Beaverton and equal grades 15 cents, to new price of $1.12 per barrel; Buckeye, 15 cents, and Billings Tobacco, and equal grades, 30 cents, to new price of $1.095 for all. It posted Bentley at $1.095. West Branch, and Arenac and equal grades were unchanged at $0.80, effective Dec. 29 last.

TORONTO—Effective Jan. 5 Imperial Oil Limited reduced prices for crude oil and crude naphtha in Turner Valley 22 cents per barrel. New prices for crude oil range from $1.14 for 40-40.9 gravity, to $1.62 for 64-64.9, with 2 cent differential. For crude naphtha of 65 gravity and higher, new price is $2.14, all prices f.o.b. producers field tankage.

PONCA CITY—Effective Jan. 1 Cat Creek, Mont., crude was reduced 10 cents, to new price of $1.30 per barrel.

TULSA, Jan. 10.—Effective Jan. 6, Stanolind Oil & Gas Co. made its initial posting of prices for Tensleep crude, in the Salt Creek, Wyo., field, at $0.70 per barrel for all gravities. This is a heavy grade crude produced from a deeper sand than the regular higher gravity Salt Creek crude. Prices for the rest of Salt Creek remain unchanged at $1.06 for oil below 29 gravity, to $1.30 for top grade of 40 and above.

TANK WAGON MARKETS

Tax column includes 1c federal tax, state gasoline tax, also city and county taxes as indicated in footnotes, and inspection fees, as shown in general footnote. These prices in effect Jan. 10, 1938, as posted by principal marketing companies at their headquarters offices, but subject to later corrections

Naphtha (In Tank Wagon)

S. O. NEW JERSEY

Posted Tank Wagon Prices	Mineral Spirits	V.M.&P.
Newark, N. J.	11.5	15.5
Baltimore, Md.	15.5	....
Washington, D. C.	15	....

Discounts: Buyers taking following quantities, at one time, get these discounts: Newark, 2c per gal. on 200 gals. or more; less than 200 gals., 0.5c higher price. Baltimore 2c off on 25 to 100 gals. and 3c on over 100 gals. Washington, 2c off to contract buyers.

SOCONY-VACUUM OIL CO.

Buffalo, N. Y.	13	14
New York City	9.5	11.5
Rochester, N. Y.	13	15
Syracuse, N. Y.	14	15
Boston, Mass.	13.5	14
Bridgeport, Conn.	12.5	14
Hartford, Conn.	12	13.5
Providence, R. I.	13.5	14.5

ATLANTIC REFINING CO.

Philadelphia, Pa.	11.5	12.5
Lancaster, Pa.	13	14
Pittsburgh, Pa.	12.5	14.5

Note: Prices for Mineral Spirits also apply to Stoddard Solvent; and prices for V.M.&P. Naphtha apply also to Light Cleaners Naphtha.

S. O. OHIO

	S.R. Solvent	V.M.&P. Naphtha
Thru Ohio	13.25	13.75

Note: V.M.&P. Naphtha prices also apply on Dry Cleaners naphtha and special Varnolene; Varnolene and Sohio Solvent 0.5c below these prices. Discounts to contract consumers, off t.w. price: 300 to 999 gals., 0.5c; 1,000 to 2,499 gals., 0.75c; 2,500 to 4,999 gals., 1c; 5,000 or more gals., 1.5c.

S. O. INDIANA

(Prices include state and federal taxes)

	Oleum Spirits	V.M.&P. Naphtha	Stanisol
Chicago, Ill.	15.9	16.2	15.6
Detroit, Mich.	19.3	18.3	19.4
Kansas City, Mo.	14.4	15.4	14.4
St. Louis, Mo.	14.7	15.7	14.6
Milwaukee, Wis.	19.3	20.3	19.3
Minneapolis, Minn.	19.5	20.5	18.1

Note: Prices for V. M. & P. apply also to Light Cleaners Naphtha. All prices, with exception of Missouri points, include state tax. Prices shown are base prices, before discounts.

Naphtha (In Tank Cars)

In Tank Cars (F. o. b. refinery or seaboard terminal except Ohio, delivered price.)

	V.M.&P. Naphtha	Solvent
Baltimore	10.5	9.5
New York Harbor	10.5	9
Philadelphia district	10.5	9
Boston	10.5	9.5
Providence	10.5	9.5
Ohio points, delivered	9.375	*8.50

*This is on rubber solvent.

Note: In Ohio, prices on D.C. naphtha and special Varnolene are same as V.M.&P.; on Varnolene and Sohio Solvent, prices are 0.5c less than on V.M.&P.

Latest Changes

From Jan. 4 to Jan. 10 inclusive. Dates and amounts of changes shown. See table for full current prices.

Continental Oil—Demand:

Cheyenne, dealer price up 2c, Jan. 4.

Imperial Oil—3 Star Imperial:

Cut 1.5c, thru Saskatchewan and Alberta, Jan. 5.

Kerosine:

Cut 1.5c, thru Alberta, Jan. 5.

Corrections

Notation of amount of change and dates not previously shown in table. Table in this issue is corrected to show these changes.

S. O. Indiana—Gasoline:

St. Joseph, Red Crown dealer price cut 1c, Stanolind dealer price cut 2c, Jan. 3.

SEABOARD MARKETS, EXPORT AND COASTWISE

All prices on this page are publisher's opinion of open market quotations or sales, for spot shipment (10 to 15 days). In cargo markets, spot shipment is 90 days. Prices in cents per gallon, except heavy fuel oil in dollars per barrel, in tank car lots, f.o.b. refineries or seaboard terminals in districts designated, unless otherwise noted. Federal, state or municipal taxes not included. Prices quoted apply on products made from legally produced crude. Unless otherwise noted, gasoline octane ratings are determined by C.F.R. Motor method, A.S.T.M.D-357-33T; and lubricating oil specifications determined according to A.S.T.M. methods, unless otherwise noted.

Eastern Domestic

(Inter-refinery and export prices not included.)

MOTOR GASOLINE

Prices Effective	Jan. 10	
District:	(a)60-64 Oct.	(a)65 Oct. & Above
N. Y. harbor	6.75	7.00
(b)N.Y.harbor	6.50	6.75
Philadelphia	7.00	7.00 – 7.25
Baltimore	6.75 – 7.25	7.00 – 7.50
Norfolk	7.00 – 7.25	7.25 – 7.50
Wilmington, N.C.	7.00 – 7.25	7.25 – 7.50
Charleston, S.C.	7.00 – 7.25	7.25 – 7.50
Savannah	7.00 – 7.25	7.25 – 7.50
Jacksonville	7.00 – 7.25	7.25 – 7.50
Portland	7.00	7.25
Boston	6.75	7.00
Providence	6.75	7.00

(a)Prices are nominal. (b)Barge lots.

WATER WHITE KEROSINE

District:			
N. Y. harbor	6.25	Charleston	6.00–6.25
(b)N. Y. harbor	6.125	Savannah	5.75
Philadelphia	6.25	Jacksonville	5.75
Baltimore	6.25	Portland	6.75
Norfolk	6.00–6.25	Boston	(e)6.25–6.40
Wilmington, N.C.	6.00–6.25	Providence	6.40

(b)Barge lots.

(c)FUEL OILS

	N. Y. harb.	N. Y. harb. barges
No. 1	6.25	6.125
Nos. 2-3	5.25	5.125
No. 4	5.25	5.00 – 5.125
No. 5	$1.45 –$1.55	.....
No. 6	$1.25	.....

	Phila. dist.	Balt. dist.
No. 1	6.25	6.25
Nos. 2-3	5.25	(d)5.25
No. 4	4.75 – 5.25	(d)5.25
No. 5	$1.45–$1.475	$1.45–$1.55
No. 6	$1.25	$1.25

	Bost. dist.	Prov. dist.
No. 1	(e)6.25 – 6.40	6.40
Nos. 2-3	(e)5.25 – 5.40	(f)5.40
No. 4	(e)5.25 – 5.40	(f)5.40
No. 5	$1.45–$1.55	.....
No. 6	$1.25	.....

(c)Fuel oils meet specifications of U. S. Commercial Standards CS12-35.

(d)Some suppliers quote 5c f.o.b. terminal for shipment within Baltimore switching district.

(f)Some suppliers quote 5.40c delivered Providence district.

(e)Top price of range represents delivered prices within local switching district.

District:	(b)Bunker C Fuel	(b)Diesel Oil
N. Y. harbor	(e)$1.25	(d)$2.20
Philadelphia	(e)$1.25	(e)$2.10–2.20
Baltimore	(e)$1.25	(d)$2.20
Norfolk	(e)$1.25	$2.20
Charleston	$1.20	$2.20
Savannah	(e)$1.20	$2.20
Jacksonville	(e)$1.20	$2.20
Tampa	(e)$1.20	$2.20
Portland	$1.35	$2.35
Boston	(e)$1.25	(d)$2.20
Providence	$1.25	$2.25

(b)In ship's bunkers.
(c)For barging add 5c per bbl.
(d)For barging add 6.5c to 7.5c per bbl.
(e)For barging add 5c to 6c per bbl.

	Gas Oil 28-34 Gravity	Diesel Oil Shore Plants
N. Y. harbor	5.25	5.25
Philadelphia dist.	5.00	....
Baltimore dist.	5.25	....
Norfolk dist.	5.25	....
Savannah dist.	....	5.25
Jacksonville dist.	....	5.25

Pacific Export

(Quotations are at seaboard, Los Angeles, in cargo lots, cents per gal., except where otherwise noted.)

Prices Effective	Jan. 10	Jan. 3
U. S. Motor, under 65 oct.	5.75 – 6.00	5.75 – 6.00
400 e.p. blend, under 65 oct.	6.00 – 6.125	6.00 – 6.125
400 e.p. blend 65 oct. & above	6.125– 6.375	6.125– 6.375
(b)38-40 w.w.kerosine	5.00 – 5.25	4.75 – 5.00
41-43 w.w. kerosine	5.25 – 5.50	5.00 – 5.50
44 w.w. kerosine	5.50 – 5.75	5.50 – 5.75

(b)150 fire point.

Prices Effective	Jan. 10	Jan. 3
In Cargo lots, per bbl.		
Diesel fuel, 24° & above	$1.45 –$1.50	$1.45 –$1.50
Diesel fuel, under 24°	$1.40 –$1.45	$1.40 –$1.45
(b)30-34 diesel(gas oil)	$1.55 –$1.65	$1.55 –$1.65
(c)Grade C fuel oil	$0.85 –$0.90	$0.85 –$0.90

Note: For San Francisco cargo prices, add 5c per bbl. to above cargo prices.

In Ships' Bunkers, or deep tank lots, per bbl.:		
(b)Diesel fuel oil	$1.625–$1.65	$1.625–$1.65
(c)Grade C fuel oil	$0.975–$1.00	$0.975–$1.00

(b)Pacific specification 200. (c)Pacific specification 400.

Cased Goods: (Per case)		
U. S. Motor	$1.45 –$1.575	$1.45 –$1.575
400 e.p. blend, below 65 octane	$1.55 –$1.65	.....
400 e.p. blend, 65 oct. & above	$1.65 –$1.75	$1.55 –$1.675
(b)40-43 w.w. kerosine	$1.35 –$1.45	$1.25 –$1.325
Kerosine, p.w.	$1.30 –$1.40	$1.20 –$1.30

(b)150 fire point.

New York Export

(Prices in cents per gal. in bbls. F.a.s. New York)

CYLINDER OILS (Pennsylvania Products)

Bright stock:		
Light, 25 p.t.	22.50 –23.00	22.50 –23.00
Dark, 25 p.t.	22.00 –22.50	22.00 –22.50
Neutral oil:		
200 3 color, 25 p.t.	24.50 –25.00	26.00 –26.50
150 3 color, 25 p.t.	22.50 –23.00	24.00 –24.50
600 Warren E filtered	20.50 –21.00	20.50 –21.00
600 s.r., unfiltered	15.00 –15.50	15.00 –15.50
650 s.r., unfiltered	18.00 –18.50	18.00 –18.50
600 fl., s.r.	18.50 –19.00	18.50 –19.00
630 fl., s.r.	22.50 –23.00	22.50 –23.00

Wax, Domestic *and* Export

(Prices in cents per lb. Tests made by A. S. T. M. methods. Melting points shown below, however, are A. M. P., 3° higher than A. S. T. M. (E.M.P.) melting points. Export prices are f.a.s. carload lots. Domestic prices are f.o.b. refineries in New York and New Orleans districts, in bags, carload lots, with 0.2c discount allowed for shipment in bulk. Scale, solid and fully refined, slabs in bags.)

Prices Effective	Jan. 10	
	New York	
	Domestic	Export
124-6 Y.C. scale	2.45 – 2.70	2.45 – 2.70
122-4 W.C. scale	2.45 – 2.70	2.45 – 2.70
124-6 W.C. scale	2.45 – 2.70	2.45 – 2.70
123-5 Fully rfd.	4.45	3.875– 4.125
125-7 Fully rfd.	4.55	4.00 – 4.25
128-30 Fully rfd.	4.80	4.25 – 4.50
130-2 Fully rfd.	4.95	4.50 – 4.75
133-5 Fully rfd.	(b)5.35	5.00 – 5.25
135-7 Fully rfd.	(b)5.60	5.25 – 5.50
	New Orleans	
	Domestic	Export
124-6 Y.C. scale	2.45 – 2.70	2.45 – 2.70
122-4 W.C. scale	2.45 – 2.70	2.45 – 2.70
124-6 W.C. scale	2.45 – 2.70	2.45 – 2.70
123-5 Fully rfd.	4.45	3.875– 4.125
125-7 Fully rfd.	4.55	4.00 – 4.25
128-30 Fully rfd.	4.80	4.25 – 4.50
130-2 Fully rfd.	4.95	4.50 – 4.75
133-5 Fully rfd.	(b)5.35	5.00 – 5.25

(b)Shipment either in bags or in bulk.

Gulf Coast

(Prices are f.o.b. ship at Gulf oil terminals representing opinions of traders, except prices specified to the contrary. Prices cover bulk shipments of 20,000 bbls. or more, unless otherwise noted.)

Prices Effective	Jan. 10	Jan. 3
For Domestic shipment:		
MOTOR GASOLINE		
59 oct. & below	(a)5.125–5.25	(a)5.125–5.25
60-64 oct. number	(a)5.25 –5.375	(a)5.25 – 5.375
65 oct. & above	5.75 –5.875	5.75 – 5.875
FUEL OILS		
No. 1	5.125	5.125
No. 2	4.50	4.50
No. 4	4.25 – 4.375	4.25 – 4.375
KEROSINE		
41-43 w.w.	5.125	5.125
For Export Shipment:		
GASOLINE		
U. S. Motor	5.125– 5.25	5.125– 5.25
60-62, 400 e.p.	5.25	5.25
61-63, 390 e.p.	5.25 – 5.375	5.25 – 5.375
64-66, 375 e.p.	5.25 – 5.375	5.25 – 5.375
KEROSINE		
44 w.w.	(a)5.50	(a)5.50
41-43 w.w.	5.125	5.125
41-43 p.w.	5.00	5.00

(a)Nominal.

Prices Effective	Jan. 10	Jan. 3
GAS AND BUNKER OILS		
For Domestic and/or Export Shipment		
(b)26-30 translucent gas oil	4.25 – 4.375	4.25 – 4.375
(b)30 plus translucent gas oil	4.50 – 4.625	4.50 – 4.625
(b)30 plus transparent gas oil	4.50 – 4.625	4.50 – 4.625
Diesel Oil Ship's bkrs.	(c)$1.90	(c)$1.90
Grade C bunker oil for ship's bunkers	(c)$0.95	(c)$0.95
Grade C bunker oil, in cargoes	$0.80 –$0.85	$0.80 –$0.85

(b)Less than ½ of 1% sulphur. (c)Barging 5c bbl. additional at some Gulf ports.

MEXICAN CRUDE AND BUNKER OILS
(F.o.b. Steamer, Tampico)

Heavy Panuco crude, taxes to be paid	(a)$0.96	(a)$0.96
Grade C bunker oil, ship's bunkers, taxes paid	$0.95	$0.95

(a)Nominal.

MID-CONTINENT LUBRICATING OILS
(Prices in cents per gal., bulk export shipment, f.o.b. Gulf or as noted below)

	Jan. 10	
	(b)Barrels	Bulk
190-200 vis. D 210 brt. stock	24.00 –25.00	18.00 –20.50
150-160 vis. D 210 brt. stock:		
0-10 p.p.	20.00 –20.50	14.00 –14.50
10-25 p.p.	20.00	13.50 –14.00
150-160 vis. E 210 brt. stock	19.50 –20.00	13.50
120 vis. D 210 brt. stock:	19.50 –20.00	13.50

(b)Second hand barrels.

	Jan. 10	Jan. 3
180 vis. No. 3 color neutral:		
0-10 p.p.	11.75 –12.00	11.75 –12.00
15-30 p.p.	11.25 –11.50	11.25 –11.50
200 vis. No. 3 color neutral:		
0-10 p.p.	12.25 –12.50	12.25 –12.50
15-30 p.p.	11.75 –12.00	11.75 –12.00
600 s.r. olive green	9.00 –11.25	9.00 –11.25
600 s.r. dark green	7.00 – 9.25	7.00 – 9.25

SOUTH TEXAS LUBRICATING OILS
(Vis. at 100° cold test 0, bulk export shipment, f.o.b. Gulf oil terminals.)

Unfiltered Pale Oils: Vis. Color		
100 No. 3	5.50	5.50
200 No. 3	7.25	7.25
300 No. 3	7.75	7.75
500 No. 3½	8.75	8.75
750 No. 4	9.25	9.25
1200 No. 4	9.75	9.75
2000 No. 4	10.00 –10.25	10.00 –10.25
Red Oils: Vis. Color		
100 No. 5-6	5.50	5.50
200 No. 5-6	7.25	7.25
300 No. 5-6	7.75	7.75
500 No. 5-6	8.75	8.75
750 No. 5-6	9.25	9.25
1200 No. 5-6	9.75	9.75
2000 No. 5-6	10.00 –10.25	10.00 –10.25

Note: Red oil prices shown above cover oils with green cast; prices for blue cast red oils are slightly lower in some cases.

Tanker Rates

(Approximate tanker freight rates to Continental ports, in shillings per ton of 2240 lbs., British sterling; to U. S. ports in cents per bbl.)

Rates Effective Jan. 10

	Crude &/or Fuel		Refined Oil &/or Spirits	
	Last Paid	Owners Ask	Last Paid	Owners Ask
Gulf-U.K./Cont.(b)	25/6	27/-28/	32/	34/
Aruba-U.K./Cont.(b)	21/6	22/-24/	28/	(a)30/
Gulf-N. Atlantic(c) (not E. of N.Y.):				
Hvy. Crude & Fuel, (10 to 19.9 gravity)	40c	42c	....	....
Light Crude, (30 Grav. or Lighter)	36c	38c	....	....
Gasoline	....	....	*37c	†a37c-38c
Kerosine	....	....	*38c	†a38c-39c
Light Fuel	....	....	*39c	†a39c-40c

(a)Nominal.

(b)Continental ports in range between Bordeaux and Hamburg, both inclusive.

(c)Venezuela loading same rate: Tampico 2c to 3c per bbl. additional.

*Correction: Correct prices for these products Monday, **Jan. 3**, were **35c, 36c, 37c respectively**, instead of 37c, 38c, 39c.

†Correction: Correct prices for these products Monday, **Jan. 3**, were **37c, 38c, 39c, respectively**, instead of 35c, 36c, 37c.

CRUDE OIL MARKETS

Prices in $ per bbl. of 42 U. S. gals. at the well. A. P. I gravity. Prices are effective as of 7 a. m. of dates as given

EASTERN FIELDS

Posted by Joseph Seep Purchasing Agency

(Effective Dec. 1, 1937, except Corning Sept. 2, 1937)

Penna. Grade Oil in Southwest Penna. Pipe Lines.....$1.88
Penna. Grade Oil in Eureka Pipe Lines (West Virginia).....$1.82
Penna. Grade Oil in Buckeye Pipe Lines (Macksburg, O.).....$1.70
Corning Oil in Buckeye Pipe Lines (Ohio)...$1.27

Posted by Other Companies

Tide Water Associated Oil Co.
Bradford-Allegany district (Penna. and N. Y.) (Effective Dec. 1, 1937).....$2.20
*The Pennzoil Co.: (Effective Dec. 1, 1937)
Penna. Grade Oil in National Transit Lines*$2.15
Ashland Oil & Transportation Co.:
Somerset Oil in Ashland Lines (Ky.):
(Effective Jan. 28, 1937)
Big Sandy River.....$1.42
Kentucky River.....$1.50

*The Pennzoil Co. posts $2.15 in Cochran, Franklin, Hamilton and Doolittle, Pa. fields; prices in other lower districts range down to $2.10 per bbl. at well.

MICHIGAN

Posted by Pure Oil Co.

Midland, Midland County (Jan. 5, 1938)....$1.12

Posted by Simrall Pipe Line Corp.

(Effective Dec. 29, 1937)

West Branch, Arenac, and equal grades.....$0.80

(Effective Jan. 8, 1938)

Beaverton, Crystal, Greendale, Porter and equal grades.....$1.12
Buckeye, Bentley, Billings, Tobacco and equal grades.....$1.095

CENTRAL STATES FIELDS

Posted by Ohio Oil Co.

(Effective Jan. 28, 1937)

Illinois, Princeton.....$1.35
Owensboro (Western Ky.).....$1.40

(Effective Nov. 20, 1937)

Lima, O.....$1.00

Posted by Stoll Oil Refining Co.

(Effective Feb. 1, 1937)

Stoll Pipe Line Oil (Ky.).....$1.40

CANADIAN FIELDS

Posted by Imperial Oil Limited

Western Ontario

(Effective Sept. 9, 1933)

Petrolia.....$2.10
Oil Springs.....$2.17

Alberta—Turner Valley

(Prices f.o.b. field tankage)

(Effective Jan. 5, 1938)

Crude Oil

40-40.9°	$1.14	53-53.9	$1.40
41-41.9	1.16	54-54.9	1.42
42-42.9	1.18	55-55.9	1.44
43-43.9	1.20	56-56.9	1.46
44-44.9	1.22	57-57.9	1.48
45-45.9	1.24	58-58.9	1.50
46-46.9	1.26	59-59.9	1.52
47-47.9	1.28	60-60.9	1.54
48-48.9	1.30	61-61.9	1.56
49-49.9	1.32	62-62.9	1.58
50-50.9	1.34	63-63.9	1.60
51-51.9	1.36	64-64.9	1.62
52-52.9	1.38		

Crude Naphtha, 65 grav. & above.....$2.14

Absorption Gasoline

90% Rec., 20 lb. Reid v.p.....$1.94
90% Rec., 17 lb. Reid v.p.....$2.08

MID-CONTINENT

Posted by Stanolind Crude Oil Purchasing Co., Jan. 28, 1937

	(In Oklahoma-Kansas)*	(In North-North Central Texas)
Below 29	$1.06	$0.96
29-29.9	1.08	0.98
30-30.9	1.10	1.00
31-31.9	1.12	1.02
32-32.9	1.14	1.04
33-33.9	1.16	1.06
34-34.9	1.18	1.08
35-35.9	1.20	1.10
36-36.9	1.22	1.12
37-37.9	1.24	1.14
38-38.9	1.26	1.16
39-39.9	1.28	1.18
40 & above	1.30	1.20

Above Stanolind prices met as follows:

Jan. 28, Continental Oil Co. met in Okla., Kans., and North Texas. Sinclair-Prairie met in North Texas and North Central Texas, Jan. 28, Stanolind's North Texas schedule. Same date, The Texas Co. met in North-North Central Texas.

Note: Stanolind prices in Okla.-Kans. are for quantities computed by 97% tank tables. In Texas, 100% tank tables are used effective Oct. 1, 1937, volume corrected to 60° F., and deduction for full b.s. & w. content.

*Effective Aug. 1, 1937, for Otis-Albert pools Rush-Barton counties, Kans., 13c less.

Posted by Carter Oil Co.

In Oklahoma

(Effective Jan. 28, 1937)

Below 25	$0.98	33-33.9	$1.16
25-25.9	1.00	34-34.9	1.18
26-26.9	1.02	35-35.9	1.20
27-27.9	1.04	36-36.9	1.22
28-28.9	1.06	37-37.9	1.24
29-29.9	1.08	38-38.9	1.26
30-30.9	1.10	39-39.9	1.28
31-31.9	1.12	40 and above	1.30
32-32.9	1.14		

Above Carter schedule met Jan. 28 by the following companies: Sinclair-Prairie, Shell and Bransdall in Oklahoma-Kansas; Skelly Oil in Kansas; Tide Water in Oklahoma; Pure Oil in Oklahoma-Kansas, beginning with below 24 at $0.98 and ending with 40 & above at $1.30.

Posted by Magnolia Petroleum Co.

(Effective Jan. 28, 1937)

In Oklahoma, same schedule as Carter Oil, which see above, beginning with below 25, at $0.98 and ending with 40 & above, at $1.30.

In Texas: North and North Central, including Burkburnett, Archer, Henrietta, Electra, Comanche and Olden, same gravity and price schedule as Stanolind in North Texas, which see under Stanolind, beginning with below 29 at $0.96 and ending with 40 and above, at $1.20.

Beaumont, Tex.

(Effective Oct. 1, 1937)

Below 21°	$0.95	27-27.9	$1.15
21-21.9	0.98	28-28.9	1.17
22-22.9	1.01	29-29.9	1.19
23-23.9	1.04	30-30.9	1.21
24-24.9	1.07	31-31.9	1.23
25-25.9	1.10	32-32.9	1.25
26-26.9	1.13	33-33.9	1.27
		34 & above	1.29

TEXAS FIELDS

Posted by Humble Oil & Refining Co.

(**West Central Texas*)

(Effective Jan. 28, 1937)

Below 29	$0.96	35-35.9	$1.10
29-29.9	0.98	36-36.9	1.12
30-30.9	1.00	37-37.9	1.14
31-31.9	1.02	38-38.9	1.16
32-32.9	1.04	39-39.9	1.18
33-33.9	1.06	40 and above	1.20
34-34.9	1.08		

*Includes Brown, Callahan, Coleman, Comanche, Eastland, Fisher, Haskell, Jones, Shackelford, Stephens, Throckmorton and Young counties.

Shell Petroleum Corp., effective Jan. 28, posts Humble's above schedule on Fisher county crude, plus these five lower grades, beginning with below 25 gravity at $0.88; 25-25.9, $0.90; 26-26.9, $0.92; 27-27.9, $0.94, and 28-28.9, $0.96; rest of schedule same as Humble's in West Central Texas.

Note: Effective Oct. 1, 1937, Humble prices are based on 100% tank tables at 60F.

**East Central Texas*

(Effective Jan. 28, 1937)

Below 29	$1.03	35-35.9	$1.17
29-29.9	1.05	36-36.9	1.19
30-30.9	1.07	37-37.9	1.21
31-31.9	1.09	38-38.9	1.23
32-32.9	1.11	39-39.9	1.25
33-33.9	1.13	40 and above	1.27
34-34.9	1.15		

*Including Anderson, Cherokee, Limestone, Navarro counties.

Same date, Sinclair-Prairie met in Mexia Humble's above schedule.

PANHANDLE TEXAS

Posted by Humble Oil & Refining Co.

(Effective Jan. 28, 1937)

	Gray County	Carson-Hutchinson
Below 35	$0.96	$0.91
35-35.9	0.98	0.93
36-36.9	1.00	0.95
37-37.9	1.02	0.97
38-38.9	1.04	0.99
39-39.9	1.06	1.01
40 & above	1.08	1.03

Jan. 28, above prices met by Sinclair-Prairie and Magnolia in the entire area and by Continental in Carson-Hutchinson and by Texas Co. in Panhandle Sweet, same as Humble's Gray Co. and on Panhandle Sour, same as Carson-Hutchinson.

EAST TEXAS

(Effective May 22, 1937)

Stanolind, Humble, Shell, Sinclair-Prairie, Texas Co., and Magnolia.....$1.35

Shell also posted on Jan. 28, in Livingston area, Polk County, Texas, $1.27.

NORTHEAST TEXAS

(Posted by Humble, Jan. 28, 1937)

Talco.....$0.73

(Posted by Magnolia, Jan. 28, 1937)

Cass County and Panola County, Tex.:

Same gravity and price schedule as S. O. Louisiana posts for Rodessa, La., which see under that company.

(Posted by The Texas Co., Jan. 28, 1937)

Cass County.....$1.25

WEST TEXAS AND NEW MEXICO

Posted by Humble Oil & Refining Co.

(Effective Jan. 28, 1937)

(Including Andrews, Crane, Crockett, Ector, Glasscock, Howard, Winkler and Upton Counties, Texas and Lea county, New Mexico).

Below 26	$0.78	33-33.9	$0.94
26-26.9	0.80	34-34.9	0.96
27-27.9	0.82	35-35.9	0.98
28-28.9	0.84	36-36.9	1.00
29-29.9	0.86	37-37.9	1.02
30-30.9	0.88	38-38.9	1.04
31-31.9	0.90	39-39.9	1.06
32-32.9	0.92	40 & above	1.08

Pecos, West Texas.....$0.91

Jan. 28, Magnolia met Humble in Crane, Upton, Howard, Glasscock, Mitchell and Winkler.

Shell Petroleum Corp., on Jan. 28, met Humble in Crane, Glasscock, Howard, Pecos (except Yates shallow pool), Winkler, and Upton counties, Tex., and in Lea County, N. Mex. On Jan. 28, Shell posted in Yates shallow pool in Pecos county, Tex., $0.81. June 4, 1937, Shell added Ector county to West Texas postings.

Jan. 28, Stanolind Oil & Gas Co. met Humble in Hendrick field, Winkler county.

Jan. 28, Texas Co. met Humble in Ward and Winkler counties, Tex., and Lea County, N. M.

April 20, 1937, Sinclair Prairie met Humble in Ward and Winkler, Tex. and Lea, N. M., counties, except that its gravity schedule ends with 36 and above, at $1.00.

Posted by Continental Oil Co.

(Effective Jan. 28, 1937)

Artesia, Jackson and Maljamar pools, N. M...$0.90

COLORADO

(Posted by Continental Oil Co.,
Effective Jan. 28, 1937)
Ft. Collins and Wellington

Below 29	$1.01	35-35.9	$1.15
29-29.9	1.03	36-36.9	1.17
30-30.9	1.05	37-37.9	1.19
31-31.9	1.07	38-38.9	1.21
32-32.9	1.09	39-39.9	1.23
33-33.9	1.11	40 & above	1.25
34-34.9	1.13		

Cannon City and Florence, Col.....$1.10

SOUTH AND SOUTHWEST TEXAS]

Posted by Humble Oil & Refining Co.

(Effective Jan. 28, 1937)

Carroll, Clark, Darst Creek, Hilbig, Salt Flat and Zoboroski fields.....$1.09
Pettus.....$1.37 Van Zandt.....$1.10

(Effective Nov. 1, 1936)

Heyser heavy....$0.90 Placedo heavy..$0.90
Heyser light..... 1.15 Taft..... 0.95

Shell Pet. Corp. on Jan. 28, posted $1.09 in Salt Flat district, Tex.

Anahuac, Dickinson, Flour Bluff and Turtlebay

(Effective Jan. 28, 1937)

Below 31	$1.16	36-36.9	$1.28
31-31.9	1.18	37-37.9	1.30
32-32.9	1.20	38-38.9	1.32
33-33.9	1.22	39-39.9	1.34
34-34.9	1.24	40 and above	1.36
35-35.9	1.26		

Jan. 28, Magnolia met Humble in Darst Creek: posted $1.00 in Luling; $1.12 in Lytton Springs; $1.27 for Cleveland, Liberty county, Tex.; $1.15 in Hardin, Liberty county, Tex.

Jan. 28, 1937, The Texas Co. met Humble in Darst Creek.

Posted by Humble

Conroe, Raccoon Bend, Tomball and Satsuma

(Deep sand crudes)

(Effective Jan. 28, 1937)

Below 29	$1.20	35-35.9	$1.34
29-29.9	1.22	36-36.9	1.36
30-30.9	1.24	37-37.9	1.38
31-31.9	1.26	38-38.9	1.40
32-32.9	1.28	39-39.9	1.42
33-33.9	1.30	40 & above	1.44
34-34.9	1.32		

Jan. 28, Magnolia met Humble in Tomball and Texas Co. met Humble in Conroe, beginning with 35-35.9 gravity.